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Developing Transit-Supportive Parking Policies:

A Synthesis of Key Concepts from the Literature

a project managed by
un projet dirigé par

cuta actu

Canadian Urban Transit Association
Association canadienne du transport urbain

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Prepared by:

Maja Bolanowska
Brendon Hemily

1995
(Revised November 2000)

CUTA Mission Statement

CUTA is the association of providers of urban transit services, suppliers and related organizations in Canada. Its mission is to promote the role of urban transit in enhancing mobility, and to support its members in the fulfilment of their mandate.

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Developing Transit-Supportive Parking Policies:
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Abstract

Parking is a critical component of the urban transportation system and has a tremendous impact on the behaviour of individual commuters and their decisions concerning mode choice. In particular, the availability and price of parking has a critical impact on the ability of transit to attract choice riders. This report is part of a study exploring parking-related policies and strategies, which support and encourage transit usage, and discourage the use of automobiles for commuter travel.

This report provides a comprehensive synthesis of literature documenting actual experiences or exploring potential new concepts. The synthesis of the literature is divided into three broad categories of policies and strategies: I] Management of Parking Supply; II] Parking Pricing Policies and Strategies; and III] Travel Allowances. The Appendices provide detailed reviews of key articles and reports related to the three categories above. The report also contains a very comprehensive bibliography. A new Appendix D reviews a number of new references identified since the initial publication of this study.

This report provides the foundation for the subsequent STRP Report 12-2, *Transit-Supportive Parking Policies; North American Experiences and Model Policies for Municipalities*, which explores actual experiences and develops model policies.

Key Words	Language
Transit Policy and Planning; Parking Policy and Pricing; Travel Demand Management	English. (Ce rapport sera aussi disponible en français)
No. of Pages	**Distribution**
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DEVELOPING TRANSIT-SUPPORTIVE PARKING POLICIES; A SYNTHESIS OF KEY CONCEPTS FROM THE LITERATURE

CHAPTER 1 - INTRODUCTION

Parking is a critical component of the urban transportation system and one that has a tremendous impact on the behaviour of individual commuters and their decisions concerning mode choice. There is reason to believe in fact, that the price and availability of parking exerts more influence over mode choice than other factors such as the price of gasoline.

At the same time, parking is a component that has generally been neglected by planners and policy makers, and certainly not incorporated as an integral part of the urban transportation system. One can find in many cities parking policies that are inconsistent with other transportation and land-use policies. It is clear that more attention should be given to understand the role of parking, and to coordinate parking policies with other urban transportation policies. This is particularly important if a municipality is developing efforts to encourage a modal shift to other modes of transportation, such as transit and ridesharing, for environmental reasons, and seeking to discourage single occupant automobile use. Given the impact of parking on mode choice in general, and on transit in particular, it will be an increasingly important area of concern for transit managers. Transit managers will need to build the partnerships that will enable parking policies to be better planned and integrated with other transportation policies, and encourage transit supportive parking policies and management strategies at the municipal level.

This report is concerned with parking-related policies and strategies which support and encourage transit usage, and discourage the use of automobiles for commuter travel. Parking policies and management strategies are actions taken to alter the supply, operation and/or demand of a jurisdiction's parking system to further the attainment of local transportation and environmental objectives. This report provides a comprehensive synthesis of literature documenting actual experiences or exploring potential new concepts. Much of the literature originates from the U.S.A., where considerable thought has been recently given to methods of reducing automobile travel through Transportation Demand Management (TDM) techniques. The synthesis of the literature has highlighted considerable reflection and experience in the use of transit-supportive parking policies and management strategies. Exhibit 1 lists the policies and strategies that are identified and discussed in this study. They are divided into three categories:

I Management of Parking Supply
II Parking Pricing Policies and Strategies
III Travel Allowances.

This document will provide a comprehensive synthesis of the various policies and strategies identified in Exhibit 1, and should serve as a valuable reference for transit managers and staff. Appendices A, B, and C provide detailed reviews of key articles and reports related to the three categories above. The report also contains a comprehensive bibliography.

EXHIBIT 1

TRANSIT-SUPPORTIVE PARKING POLICIES AND STRATEGIES

I MANAGEMENT OF PARKING SUPPLY

1. Requirements for New Developments
   1) Reduction of Minimum Requirements
   2) Establishing Maximum Requirements
   3) Negotiated Flexible Requirements
      a) Provide in-lieu payments for reduced requirements
      b) Support for ridesharing and/or transit for reduced requirements
      c) Shared use of common parking facilities as factor in determining requirements
   4) Regulation of Leasing Practices (separating leasing of office space from leasing of parking)

2. Municipal Parking Supply Management Strategies
   1) Parking Caps
   2) Restraints on Principal-Use Parking Facilities
   3) Restrictions on Access to Parking by Commuters
      a) Area parking permit programs
      b) Time of day restrictions
      c) Meter parking
      d) Eliminating curb lane parking
   4) Trip Reduction Demand Management Ordinances Restricting SOV Parking Supply
   5) Increased Enforcement

II PARKING PRICING POLICIES AND STRATEGIES

1. Pricing of Parking Under Public Control
   1) Introduction/Increase of Parking Rates
      a) on-street parking
      b) off-street parking
   2) Parking Rates to Encourage Short-Term Use (shoppers, etc.) and Discourage Long-Term Use (commuter parking)
   3) Reduced Rates for Preferred Vehicles (ridesharing, energy-efficient vehicles)

2. Economic Disincentives/Taxes to Modify Demand for Parking
   1) Parking Revenue Tax
   2) Parking Space Tax
   3) Parking Surcharges
      (ad valorem, based on hours parked, fixed amount)
      a) peak-period surcharges
      b) all-day surcharges

III TRAVEL ALLOWANCES

1. "Cash-Out" Option (employer requirement to offer employees equivalent of market value of parking subsidy as taxable cash travel allowance)
2. Replacing Employer-Subsidized Parking with Travel Allowances for Every Employee (tax exempt in U.S.)
3. Reclassification of Employer-Provided Parking as a Taxable Fringe Benefit
4. Tax Exemption of Employer-Provided Transit Passes (already in existence in U.S.)

CHAPTER 2 - MANAGEMENT OF PARKING SUPPLY

A BACKGROUND

The supply of parking is an important determinant underlying commuter choice of travel mode. Existing evidence suggests that excessive availability of parking encourages single-occupant vehicle (SOV) driving. The tighter the parking supply, the more likely drivers will consider using alternative modes. Thus, parking supply restrictions can induce shifts from SOV driving towards transit and ridesharing.

While there are concerns regarding adverse impacts of a tighter parking supply on economic development, there is some evidence suggesting that these concerns are generally overstated. Parking supply is not likely to play a central role in economic development decisions, but can play a significant supporting role.

The effectiveness of parking restriction measures has been shown through an analysis of trip reduction levels. One study concluded that 5 of 6 sites with trip reductions of over 30% had substantial parking restrictions, as did all 9 sites with trip reductions between 15% and 30%. In contrast, 4 of the 7 programs with low trip reductions levels (less than 15%) had not limited parking supply.

B. KEY POLICIES AND STRATEGIES

Exhibit 2 lists the policies and strategies that can be used to manage the supply of parking in ways that discourage automobile use and encourage transit use.

1. Requirements for New Developments

1.1 Reduction of Minimum Parking Requirements

Minimum requirements are local regulations specifying the amount of off-street parking space that has to accompany new or refurbished buildings. The purpose of minimum requirements is to ensure that users of the building park as little as possible on streets or in lots intended for others.

If minimum parking requirements are set above the market demand, there will be an oversupply of parking and the overall price for parking will decrease. A result of this will be a substantial increase in the number of trips using both long-term and short-term parking. Therefore, an attempt to solve local congestion problems through the imposition of minimum parking requirements (that are too generous) may in fact achieve the opposite effect: the increased number of trips resulting from the imposition of excessive parking requirements would in fact aggravate street circulation problems in the downtown area and cause additional congestion.

EXHIBIT 2

MANAGEMENT OF PARKING SUPPLY;
TRANSIT-SUPPORTIVE POLICIES AND STRATEGIES

1. Requirements for New Developments

   1) Reduction of Minimum Requirements

   2) Establishing Maximum Requirements

   3) Negotiated Flexible Requirements
      a) Provide in-lieu payments for reduced requirements
      b) Support for ridesharing and/or transit for reduced requirements
      c) Shared use of common parking facilities as factor in determining requirements

   4) Regulation of Leasing Practices
      (separating leasing of office space from leasing of parking)

2. Municipal Parking Supply Management Strategies

   1) Parking Caps

   2) Restraints on Principal-Use Parking Facilities

   3) Restrictions on Access to On-Street Parking by Commuters
      a) Area Parking Permit Programs
      b) Time of day restrictions
      c) Meter parking
      d) Eliminating curb lane parking

   4) Trip Reduction Demand Management Ordinances Restricting SOV Parking Supply

   5) Increased Enforcement

Minimum parking requirements may also cause serious problems in the land market, for example creation of a disincentive to inner-city redevelopment and high-density development. Where a zoning ordinance requires provision of more parking spaces than is justified by the price they command, the excess spaces result in a deficit for the developers that would discourage redevelopment of older areas. Since the marginal cost of providing more parking spaces at a site increases dramatically for underground or multi-storey structures, the deficit per square foot of additional building space would increase more than proportionally with building size. This is a clear disincentive to high-density development. Another possible land market effect of parking requirements is alteration of the spatial pattern of new development. The attempt by developers to minimize the parking deficit (caused by falling parking prices) would tend to shift new development away from areas best served by mass transit and toward areas where automobile use (and thus the demand for parking) is highest. Such a tendency may counteract other local policies designed to encourage development in areas easily accessible by transit.

It therefore may be desirable to reduce the minimum parking requirements associated with new or redeveloped developments. This will help to reduce excess supply of parking, which in turn will encourage developers to increase the fees they charge for parking.

1.2 Establishing Maximum Parking Requirements

The main role of maximum parking requirements is to ensure parking supply is limited in order to support other programs for traffic mitigation. Since, the upper limit on the number of parking spaces is supposed to force the supply below what would be provided by the private market, the maximums should be set on the low side of estimated demand.

Introduction of maximum rates does not involve significant implementation barriers; only code modifications are required, supported by periodic parking demand studies. Localities typically have the authority to regulate parking supplies by way of parking requirements in codes.

It should be particularly valuable to implement this policy for new developments in proximity to transit, since the resulting limited parking supply would provide a substantial incentive for transit use. As well, maximum requirements should be considered in proximity to suburban rail stations, given excess parking supply in many suburban developments.

Exhibit 3 outlines the minimum and maximum parking requirements used in a variety of communities documented in the literature.

EXHIBIT 3

MINIMUM AND MAXIMUM PARKING SPACE REQUIREMENTS FOR VARIOUS CITIES

City:	Requirements:	Reference:
CBD of Los Angeles	min: 1 space per 1000 sq ft	1973 (1), 1989 (3)
Los Angeles (not CBD)	min: 2 spaces per 1000 sq ft	1973, (1)
	min: 2 spaces per 1000 sq ft, soon to be increased to 3 spaces	1989, (3)
Long Beach (CA)	min: 1 space per 1000 sq ft	1973, (1)
Santa Monica	min: 2 spaces per 1000 sq ft	1973, (1)
Newport Beach, Santa Barbara, South Pasadena (CA)	min: 4 spaces per 1000 sq ft	1973, (1)
Fountain Valley (CA)	min: 1 sq ft of parking for 1 sq ft of building	1973, (1)
Placentia (CA)	min: 8 spaces per 1000 sq ft	1973, (1)
Sacramento (CA)	min: 1.67 spaces per 1000 sq ft	1981, (2)
Palo Alto, (CA)	min: 4 spaces per 1000 sq ft	1985, (2)
CBD of Portland, (OR)	max: 1 space per 1000 sq ft	1985, (2)
Portland, (OR)	max: usually 1 space, but range to a low of 0.7 spaces per 1000 sq ft min: there are no minimums except for residential uses	1989, (3)
Bellevue, (WA)	max: 3 spaces per 1000 sq ft min: 2 spaces per 1000 sq ft	1982, (2)
San Francisco, (CA)	max: 7% of gross floor area	1985, (2), (3)
Sunnyvale, (CA)	max: 5.7 spaces per 1000 sq ft	1985, (2)
Seattle, (WA)	max: 1 space per 1000 sq ft min: vary by proximity to transit, 0.54 spaces per 1000 if close to transit and 0.75 spaces in areas with moderate access to transit	1989, (3)
Denver, (Colorado)		1989, (3)
CBD	no requirements maximum or minimum	
not CBD	min: 2 spaces per 1000 sq ft	
Hartford, (Connecticut)	min: 1 space per 1000 sq ft	1989, (3)
Toronto, (Ontario)	min: 3.33 spaces per 1000 sq ft (net)	1980, (5)
Toronto, (Ontario)	min: 0.6 spaces per 1000 sq ft (net) max: 0.69 spaces per 1000 sq ft (net)	1982, (4)
Edmonton, (Alberta)	min: 1 space per 1000 sq ft, either in the building or within 400 ft of the entrance; if direct access to pedway, min: 1 space per 2000 sq ft; if direct access to light rail transit, min: 1 space per 25,000 sq ft	1982, (4)

EXHIBIT 3 CONTINUED

Vancouver, (B.C.)	max: usually 1 space per 1000 sq ft	1982, (6)
Sacramento	min reduced by 5% if bicycle facilities provided; min reduced by 15% if spaces reserved for carpools; min reduced by 60% if transit passes are provided.	(7)
Atlanta	none	(8)
Charlotte	min: range from 0.5 per 1000 sq ft for 1st 200,000 sq ft to 1.25 per 1000 sq ft for over 800,000 sq ft. max: none	(8)
Denver	none	(8)
Indianapolis	none	(8)
Madison	none, but each project reviewed	(8)
Minneapolis	no spaces required for first 800,000 sq ft	(8)
Phoenix	none	(8)
Philadelphia	none	(8)
Pittsburgh	none	(8)
San Diego	min: none max: 1 space per 1,000 sq ft	(8)

References for above table:

(1) Shoup, D.C. and Pickrell, D.H. (1978), "Problems with Parking Requirements in Zoning Ordinances". Traffic Quarterly, Vol. 32, No. 4, pp. 545-561.

(2) Higgins, T.J. (1985), "Flexible Parking Requirements for Office Developments: New Support for Public Parking and Ridesharing". Transportation, Vol.12. Elsevier Science Publishers, pp. 343-359.

(3) Higgins, T.J. (1989), "Parking Management and Traffic Mitigation in Six Cities: Implication for Local Policy". Transportation Research Record No.1232. Transportation Research Board, pp. 60-67.

(4) Smith, W.S. (1983), "Automobile Parking Trends". Transportation Quarterly, Vol.37, No.3. Eno Foundation for Transportation, pp. 431-452.

(5) Stewart, G. (1982), "The Development of Revised Parking Policies in the Central Area of the City of Toronto". The Proceedings of the 1982 National Conference of the Canadian Institute of Planners, pp. 216-223.

(6) Levinson, H. (1983), "Travel Restraints in City Centers: The American Experience". Transportation Quarterly, Vol.37, No.2. Eno Foundation for Transportation, pp. 277-288.

(7) Macrae, M. (1994), Transportation Demand Management: "A Policy Challenge". Canadian Energy Research Institute, p. 6-20.

(8) The Urban Transportation Monitor, April 2, 1993.

1.3 Negotiated Flexible Parking Requirements

Flexible parking requirements are policies wherein developers are offered reduced on-site parking requirements in return for an agreement to adopt specified traffic-mitigation actions. Most actions prompted by flexible requirements are designed to influence demand for non-SOV (Single Occupant Vehicle) modes, such as subsidizing transit and providing preferential parking for carpools. The strategy of negotiating flexible parking requirements is designed in such a way as to benefit both the community and the developers. The community achieves improved traffic flows, decreased pollution levels and more efficiently used parking facilities. Developers spend less on construction and maintenance since they provide less parking. The flexible requirement concept may be most acceptable as a regional strategy, in order to reduce the fear that the strategy might result in a shifting of employment or of the tax base from one municipality to another, or in a decrease in the growth of employment.

Enforcement of supply management programs placing conditions on developers typically involves denial of the building or occupancy permits for developers who fail to develop or implement an appropriate travel reduction plan in accordance with ordinance requirements. Other possible provisions for non-compliance may include revoking occupancy permits, or forfeiture of a bond provided annually by the property owners to guarantee the implementation of the negotiated requirements.

There are three categories of flexible parking requirements. The first category is tied to fees in support of public parking facilities. These have two purposes: a) to generate financial support from the private sector for public parking which might otherwise come from taxes or other measures and b) to realize economies of scale in one or two public parking facilities serving all developments, rather than several facilities, one at each development. The second category is to create incentives for transit and/or ridesharing. The intent here is to reduce traffic to and from the new developments. The third category is tied to shared use of parking facilities. The purpose here is to use the parking facilities to the utmost efficiency while providing lesser amount of parking. Each category is briefly described below.

1.3(a) Provide in-lieu payments for reduced requirements

Such payments are typically based on the costs or a percentage of the cost of providing parking in these locations. Zoning that allows for in-lieu fees is believed to be most practical in communities where there is an active and ongoing construction program for off-street public parking. The likelihood of success of in-lieu fees is increased when a community is expecting a rapid rate of development in a concentrated area. As well, relatively high parking requirement and tight sites for development usually encourage payment of in-lieu fees. The success of this strategy can be enhanced by managing the availability of public parking, and developing effective strategies for parking fees and fines.

To date, there has been limited application of in-lieu fees for reduced parking requirements. That limited application is a reflection of a variety of planning and administrative problems in the use of in-lieu fees. The following problems are possible with this approach:

1) Convincing developers that the fees paid in lieu of parking will result in the construction of public parking facilities. Uncertainty about a community's ability to construct parking in the pre-arranged time may make developers decide not to agree to the scheme. Also, developers

may not choose to pay optional in-lieu fees for parking depending on the level of the fee, the ease of providing parking on site and the parking requirement in code.

2) Another problem is determining the appropriate charges for in-lieu contributions. Even if fees are forthcoming, it is not certain they will be sufficient to support present parking needs and continuous provision of parking in the future.

3) Where cities delay the provision of parking, inflation may make it difficult to provide the desired supply.

4) Any parking facilities that are constructed through in-lieu fees must be in close proximity to the land uses they are intended to serve; the developers making contributions will require that. Therefore, it is a major administrative task to choose and acquire sites in locations convenient to those land uses for which in-lieu fees have been contributed.

5) Finally, in-lieu fees for parking may not make sense or may not be feasible in certain circumstances: a) when a city grants reductions in requirements for other policy reasons that are more attractive than in-lieu fees (e.g. simply locating downtown), b) where there is little space for public parking, and c) where the pace of development is slow.

1.3(b) Support of ridesharing and transit for reduced requirements
(provision of: transit passes, information about transit routes, shuttles from transit stations to work places; set aside parking for ridesharing or non-commuter parking)

Cities vary considerably in their approach to the issue of gaining developers' agreements to ridesharing or transit measures. Under optional relaxations, cities rely upon the usual desire of developers to minimize parking. Under mandatory relaxations, parking requirements are set as maximums below expected levels of demand, which triggers mitigation measures including support of ridesharing and transit.

Ridesharing and transit supporting programs resulting from relaxed parking requirements do not always lead to the intended results. Designating carpool spaces does not necessarily lead to great increases in carpooling. Offering transit passes on employers' premises does not necessarily lead to many sales. Promoting van and carpools does not necessarily create much ridesharing. Comparison of case studies shows that the outcomes of ridesharing and transit actions depend on several variables which may, or may not, be acting in support of the programs. One such variable is the degree of employers' willingness to spend time and money in order to introduce ridesharing and transit actions. Case studies show that developers take advantage of the ridesharing relaxations only where opportunities for other relaxations are not readily available and the costs of the ridesharing measures make sense relative to garage construction costs or the opportunity cost of foregone office space. Thus, flexible parking requirements do not always attract as many developers as local planners would like. Generally, developers/employers take the easiest and least costly programs first, including non-compliance. Variables which support transit/ridesharing programs include: limited parking supply and high parking prices, active neighborhood groups lobbying against employee parking on neighborhood streets, etc.

Planners should understand and estimate the costs to developers of relaxations and the cost of transit/ridesharing measures before introducing relaxations into codes. Agreements with developers will be forthcoming only where costs and complexities of ridesharing/transit programs are less than the

cost of the relaxations. Planners should remember that developers will take the easiest and least costly ways to gain relaxations. Making ridesharing/transit programs mandatory in order to ensure that they are introduced by developers is a possibility that should be carefully evaluated; given that actions to encourage ridesharing and transit may not be effective in reducing the demand for parking, depending on the circumstances, planners should evaluate their potential before building them into codes tied to parking relaxations. Clearly, requiring developers to introduce ridesharing programs makes little sense if commuters will not utilize them. Planners should check if favourable conditions are present in the area (tight and/or expensive parking, active neighborhood groups).

1.3(c) Shared use of common parking facilities as factor in determining requirements

Shared parking is a supply management strategy which encourages more compact, mixed-use development and greater efficiency in land use. Shared parking opportunities exist where the same parking spaces can be utilized by two or more different land uses due to differences in the principal operating hours for the uses involved. Typically, distinctions between day and nighttime uses or weekday and weekend uses have to be present to make provisions for shared parking. This strategy can be used equally successfully in urban areas as in suburbs. Shared parking can be achieved either with the use of municipal parking facilities or privately owned parking lots/parking structures. The additional advantage of this strategy is that developers can realize significant cost savings.

Many zoning ordinances are vague or very restrictive regarding shared parking, reflecting concerns about administrative problems tied to this type of parking. These concerns include: protection of rights to the use of shared parking facilities, division of maintenance costs, problems arising with changes in property ownership, land uses, or hours of operation in existing uses.

The following prerequisites have been identified to the effective use of shared parking:
1) the parking requirements for individual land uses must reflect the actual peak demand for parking as closely as possible. If the parking requirement for a certain land use is too low, the reduction for shared parking will make the already low requirement even more deficient, thus creating a severe undersupply.
2) the land uses and the common parking facility must be owned by the same developer/owner and located in close proximity to one another. The nearness is required so that parkers would be willing to walk to either use from most points in the parking lot. To assure that shared parking is feasible, developers requesting reductions for shared parking should submit their plans for site plan review.
3) each parking space should be usable by all parkers, i.e. no restrictions.
4) the developer/owner must understand that any subsequent change in land uses within the mixed-use development would require a new occupancy permit and proof that sufficient parking will be available.

1.4 Regulation of Leasing Practices
(separating leasing of office space from leasing of parking)

The traditional practice of providing low-cost, plentiful parking makes it difficult to implement parking management strategies that make travel in carpools or by transit more attractive than driving alone. Property owners (and lenders) see investment in parking as one that by itself does not return enough to even meet the cost of service, but is necessary for the marketability of the property. Property owners are willing to charge tenants less than it costs to provide the parking, because tenants may otherwise be unwilling to lease the office space. Often writedowns on rents for work space are accomplished through the reductions in parking rents.

Present leasing practises are such that they discourage implementation by employers of transit/ridesharing programs. For example, the amount of parking that company has for its use is fixed by the terms of the lease and cannot be changed from year to year. This inability to vary the amount of parking to be leased from year to year, serves as a great impediment to inducing tenants (i.e. employers) to offer employees incentives to not to drive their cars to work. The reason for it is fact that the monthly parking costs will be the same regardless of whether the parking is used or not. Another example: the practice of setting parking and office space costs within one cost stream works against persuading tenants to reduce the amount of parking they lease. Separating the costs would present employers with the opportunity to see just how much parking costs them and furnish a more rational basis for determining how much is to be spent on parking and on lower-cost incentives to employees to reduce parking demand, thus lowering monthly operating costs. Of course, this strategy would only work in circumstances where tenants are free to choose the amount of parking they need rather then being required to take a fixed amount as dictated by the terms of their lease.

Regulations should be passed that require separation of the cost of office space and parking in leases. Owners, lenders should not be allowed to purposely decrease the value of parking or provide free parking spots to make the property more alluring.

2. Municipal Parking Supply Management Strategies

2.1 Parking Caps

This strategy consists of a limit on total number of allowable parking spaces within specified areas. Parking caps can be set either on the total supply of all types of parking, or they can apply only to commercial spaces open to public (but not employee and customer parking). Experience to date in urban centers indicates that parking cap is an effective tool to limit SOV usage and increase or at least maintain good transit usage.

2.2 Restraints on Principal Use Parking Facilities

The construction of principal-use parking facilities is prohibited or severely limited by the zoning laws. For example in San Francisco, proposed new principal-use parking facilities must undergo a conditional use review. Chicago and Seattle prohibit the development of principal-use parking facilities in all of their CBDs.

2.3 Restrictions on Access to On-Street Parking by Commuters

The strategies included in this category exercise a restrictive influence on the demand for available parking but they do not alter the available supply of parking. These strategies establish priorities of access to the supply in selected areas, which tends to exclude certain kinds of users (for example commuters) and favor others (residents of the area, carpoolers). Analysis of case studies, where restrictions on access to parking have been implemented, indicated that they are most effective in places where supply is already limited. The strategies included in this category consist of: a) residential parking-permit programs, b) time of day restrictions, c) meter parking, and d) preferential on-street parking for high occupancy vehicles.

2.3(a) Area Parking Permit Programs

Residential Parking-Permit Programs (RPPPs) are the most widespread form of on-street parking tactics. They are initiated to control the excess parking demand created by persons who live outside a neighbourhood but park their vehicles there in order to work, shop or attend a nearby school. They are especially meant to prevent long-term parking by commuters in residential neighbourhoods that are close to employment centers. In the majority of cases RPPPs are implemented in specific neighbourhoods or subareas of cities only, because of the local nature of the parking problems that these strategies are designed to address.

Within the RPPPs, the restrictions on nonresident parking range from complete prohibition to limited parking privileges (usually 2 or 3 hrs of parking allowed). Communities that allow nonresident parking for limited periods are frequently trying to preserve short-term parking opportunities for shoppers and business clients. The limitation of this approach is the increased level of enforcement required to monitor the duration of nonresident parking.

The impacts of residential parking regulations are various. Some commuters who can no longer park all day on streets may change their parking locations to off-street facilities or may park on unregulated streets just outside the affected district. Others may switch to transit or carpool mode. Others yet, may remain in the district and just move their cars from one space to another to conform to the time limits. The degree to which residential parking regulations will prompt any of these changes will depend on several factors, including existing parking supply and demand, the price of off-street parking, transit service to the area, and the stringency with which the regulations are enforced. Analysis of case studies showed that residential parking-permit programs have been very successful. Communities that have implemented RPPPs feel that the parking problems they hoped to correct were substantially or completely resolved.

2.3(c) Meter Parking

Meter Parking Programs were found to be an effective means of controlling parking vehicles. In general the result of meter parking was reduction in average parking duration, reduced parking occupancy and increased turnover.

2.3(d) Eliminating curb lane parking

Eliminating curb lane parking is another way to restrict access to commuter parking. Implementation of this strategy along major arterial and collector streets would reduce total energy consumption by reducing stop-and-go traffic and eliminating some delays and idling. It would also facilitate better movement of buses. Eliminating this form of parking would reduce congestion and improve transit speeds and transit supply capacity, and thereby improve the public's perceptions of transit.

2.4 Trip Reduction Demand Management Ordinances Restricting SOV Parking Supply

In some cases, the power to actually force reductions in SOV parking supply, may be provided to agencies responsible for the TDM programs. This is represents a level of authority that is likely to be conveyed to an agency only in situations of extreme air quality problems, and is more likely to be used as a potential threat than a evryday tool.

2.5 Increased Enforcement

Comprehensive and well managed enforcement programs are critical to success of most parking

policies. In the past few years, several cities have initiated aggressive policies regarding the enforcement of parking regulations in order to encourage compliance to new parking strategies, increase general revenues and, improve traffic circulation and the use of on-street parking. The enforcement policies consist of: a) increased level of ticketing, b) towing, c) booting, d) development of procedures to apprehend those who have not paid outstanding citations, and e) administrative adjudication. Well managed parking enforcement programs can bring about: 1) significant reductions in parking violations, 2) substantial increases in available parking supply, 3) improved parking conditions and increased mobility in downtown areas, and 4) major increases in parking-user revenues.

Example of effects of increased enforcement: In Washington studies of parking turnover in the CBD were conducted before and after the enforcement program was initiated in 1978. The results showed that the number of legal hours parked at metered spaces increased from 13 to 56 percent and the number of illegal hours decreased from 84 to 31 percent. Turnover increased from 1.2 to 2.9 vehicles/h.

Aggressive ticketing. Some cities have ensured more aggressive ticketing through transferring enforcement responsibilities from police departments to traffic departments. Unlike regular police, civilian parking patrol officers regard parking violations as their first priority. They monitor parking meters, hourly restrictions and parking regulations. They are also responsible for identifying vehicles in tow away zones and notifying the towing dispatcher.

Towing. Many communities have towing operations or hire contractors to remove illegally parked cars. In majority of places towing is done primarily when illegally parked cars affect traffic circulation (for example car parked in loading zone), or they prevent access of emergency vehicles or are obstructing fire hydrants. To retrieve the vehicle, the motorist must pay a towing cost, a fine and all outstanding tickets.

Booting. If a car of a motorist with a certain number of outstanding parking citations is identified, the vehicle is immobilized by clamping a "boot" on a front wheel. Motorist must then pay all outstanding fines plus the booting fine. Several studies indicated that this program is a more cost-effective way than towing in dealing with problem of parking violations.

Administrative adjudication. The idea of transferring adjudication responsibilities from city criminal courts to traffic departments. The main advantage of this transfer is that the traffic department is likely to place a higher priority on parking enforcement. In addition, the records are centralized in one agency which would speed up the process of processing parking tickets. Another advantage of this concept is that it allows the traffic department to administer penalties that are consistent with its ticketing policies (traffic departments have been often "frustrated" in their parking enforcement efforts by the courts, which fail to impose serious fines on repetitive parking violators).

C. LOCAL CONDITIONS WHICH INCREASE THE EFFECTIVENESS OF SUPPLY MANAGEMENT STRATEGIES

a. Mixed uses are available or planned where parking spaces can be shared and used jointly by different travellers (e.g. by commuters during weekdays and shoppers at other times).
b. Employer subsidies for parking are not extensive.
c. Nearby private and commercial parking supply is well utilized and enforced (thus limiting opportunities for parkers to simply shift parking locations as supplies are tightened) and

uncontrolled parking supply is low.

d. The costs of providing parking are high compared to traffic mitigation alternatives.

e. Transit capacity is not saturated.

f. Employers in the affected areas consist mostly of large companies (over 1000 employees), with numerous clerical or data processing staff (which are more sensitive to parking prices).

g. With respect to the parking program, there exists strong management, high visibility, a commitment of resources, and strong monitoring and vigilance.

h. Other positive conditions: a) proximity of companies to transit service, b) preferential treatments for ridesharing and transit on streets and highways near employment sites, c) limited parking availability both on- and off-street and high prices at surrounding parking lots.

D. KEY ISSUES AND RECOMMENDATIONS

a. Analysis of case studies indicated that for suburban communities the most effective supply management policies are 1) reduction in minimum parking requirements and 2) establishment or reduction in maximum requirements. For urban communities the most effective strategies were found to be flexible requirements.

b. Generally, communities with area-wide traffic problems caused by new and existing employment should consider ordinances applicable to all medium-to-large employers. Communities with spot congestion problems attributable to new development should consider special permits and developer agreements (flexible requirements).

c. Minimum and maximum parking requirements.
Maximum and minimum requirements should be set after careful assessment of the parking market and local HOV goals. In order to accommodate specific needs of particular sites, it would be desirable to have flexibility in the minimum and the maximum requirements stipulated in revised parking codes. Minimums and maximums should be set on the low side of estimated demand, so they do not limit other traffic mitigation strategies. It may become necessary to consider and implement collateral actions such as parking prohibitions for non-resident vehicles in the surrounding neighborhoods to safeguard against possible spillovers. Planners must be prepared to constantly monitor the parking demand and supply market, and adjust requirements over time with respect to future changes in development, transit and driving trends. The code revisions should be introduced gradually and impacts of these policies should be evaluated along the way. One of the first changes should be to set a low maximum requirement in the immediate vicinity of transit corridors and major terminals.

The minimum and maximum requirements should vary throughout the city. These graduated zoning schedules should reflect development intensities and transit service availability.

d. The support of ridesharing and transit for employee trips should be pursued directly (e.g. through ordinances or flexible requirements) rather than tied to optional reductions in parking requirements.

e. Flexible requirements should act as an incentive and support mechanism rather than the main vehicle for encouraging traffic mitigation. This strategy should be approached with caution. Experience indicates that quite often developers do not take advantages of the relaxations, rendering the whole experiment a failure. Flexible requirements are difficult to set up, because knowing what developers and lenders prefer to provide in a way of parking supply is not a simple task. Even if

planners are able to determine the market demand and supply levels at any one time and place, the demand-supply equation is constantly varying because of everything from the state of the economy to the price of gasoline to the level of transit service.

f. Any policy aimed at reducing parking supply will have a greater chance of acceptance if it covers a large region rather than one or few jurisdictions. The policy should however, contain variations in the actual requirements over the geographic areas to reflect different conditions.

g. Overall caps, although potentially effective, have problems associated with them. They require legislative initiatives and take time to implement. Any subsequent increase in the existing caps, if needed in the future, also will require legislative actions. Thus, the ability and time to respond to unexpected consequences (e.g. supply shortfalls) could be quite slow. Thus, it is a relatively slow instrument when there is a need to respond to specific sub-area concerns. Within a large area, it might be desirable to implement different caps to account for different levels of congestion and modal usage.

h. So far, in many cases, flexible requirements did not work because developers did not take advantage of them. Primary reasons for this lack of use are: a) the low level of minimum parking currently required, b) the lack of specified evaluation criteria for permit approval, c) the fear of local lenders that reduced parking will lessen marketability, d) restrictive provisions of the ordinance, specifically the requirements for land set-asides, e) most developers do not know that the incentives exist because of a lack of any city budget, staff or materials set aside for publicizing the ordinance, f) unwillingness of developers to tolerate the delay of 3 to 9 months typically required for approval, and g) confusion from the diffusion of responsibility for the parking incentives among three city departments: transportation, planning and zoning. It seems that flexible requirements strategy can be effective only in cities where parking code requirements are perceived to be above market requirements.

i. All case studies indicate that the policy of flexible requirements is quite successful in achieving pre-set goals. The only difficulty with respect to this policy is its ad hoc nature. Developers want to know what the city will require in advance. It is suggested that the cities develop some way to codify or standardize the requirements through a handbook, this will ensure equity and lessen uncertainty.

j. One issue that the cities with ordinances need to decide is whether to require implementation of specific TDM actions (i.e. an on-site TDM coordinator or carpool matching) or to require meeting specified performance measures (for example: 25% of all employees ridesharing, accomplished with whatever TDM action the employer or developer deems appropriate). The general consensus is that both of the alternatives are working well, but that the second option usually brings better returns.

k. Issues related to noncompliance.
Cities do not have many options here, and there is reluctance to enforce mitigation conditions by revoking occupancy permits as this action seems very drastic to all concerned. Measures need to be developed that assure developer compliance without resorting to litigation. Action that would hold developers accountable with quick recourse could be a bond or cash deposit held in escrow that could be forfeited if after a reasonable period of time, the stated goal is not met or specifications not implemented. The advantage of such action as a mechanism for compliance is that the initiative to achieve the objectives will reside with the developer/owner who will be anxious to have the deposit released. The amount of deposit could be tied to the number of parking spaces eliminated by the higher proportion of employees using HOV's (including transit), or it could be based on some fraction of the cost of the proposed parking facility.

l. Quite often the developer and/or building owner perceive the zoning requirements and ordinances as a threat to parking income and the marketability of the new office space. Since the ridesharing (i.e. transit and carpool supporting) programs need the continuous commitment on the part of developer/owner to be successful, the above behaviour can seriously undermine these programs. By their nature, ridesharing measures present greater opportunity for violation and fewer avenues of enforcement. That should be taken into account when these strategies are proposed for implementation.

m. The case studies, which are all taken from the U.S., indicate that even aggressive parking policy cannot always boost transit ridership, especially in the face of counteracting variables (such as declining real gasoline prices or reductions in transit service). However, the case studies show that limited and costly parking certainly appears to be associated with the highest modal splits for transit.

n. The success of traffic mitigation strategies related to parking supply is heavily dependent on variables other than the strategies themselves. The size and makeup of the employment force, the availability of parking, the proximity to transit are some of these variables. Consequently, it is no surprise that cities have very mixed results when implementing specific mitigation strategies. Mitigation programs require constant vigilance and enforcement complexities. Local governments should investigate the potential of cooperation with the private sector about the traffic mitigation strategies. The success of many programs may be determined to a large degree by the energy, commitment, resources and visibility given to them.

o. The policy of reduction in parking rates for carpoolers is thought to have better results in achieving higher carpool mode split than the policy of just setting-aside some parking spaces for carpoolers. It is recommended that in any location where the carpool set-aside is used that it be accompanied by the reduction in the monthly parking rate for carpoolers. Such a double incentive measure has a much higher probability of succeeding.

p. Localities do not need to institute stringent laws to ensure program success. More important than the exact policy terms and provisions is how implementation proceeds. Nevertheless, programs should include provisions for financing monitoring, plan review, and enforcement. Too often, instruments ignore the need for fees and financing. These provision are important for initiating TDM and PM efforts, setting commitments and resources, and establishing the evaluation framework.

r. As a general rule, localities must be cautious about specifying TDM and PM strategies because it is difficult to estimate their probable effectiveness. Programs should avoid requiring specific proportions of parking devoted to carpool stalls or the provision of discounted transit passes or imposition of specific parking prices. The preferred approach is to require and negotiate plans spelling out strategies and then to evaluate and approve these on the basis of their suitability to the site and employee population. This approach is especially recommended for special permits and ordinances applying to large areas.

s. Localities must monitor and enforce policies, but must be careful not to develop or try to enforce binding traffic or mode share standards that are too stringent. Localities must appreciate that some of the variables influencing traffic volumes and commuting patterns to and from employment sites are not within the control of employers or developers.

CHAPTER 3 - PARKING PRICING

A. BACKGROUND

The pricing methods focus on control of demand. By changing the design of parking price schedules they encourage redistribution of parking demand over space and over time, and/or reduction in the total demand level.

The price of parking may be the most potent demand management strategy available in many areas. This stems from the fact that, as research has proven time and time again, the cost of parking is the single greatest determinant as to whether people will or will not drive (assuming they have an alternative). One recent study found that parking pricing alone was as effective in reducing trips as a combination of several demand management strategies implemented without parking pricing (M. Mehranian et al, "Parking Cost and Mode Choices Among Downtown Workers: A Case Study").

Reasons for implementation of parking pricing:

a) to accommodate automobile travel without capital-intensive changes,
b) to alter the operations and supply of parking and influence the demand for parking to further the attainment of local transportation or other urban objectives,
c) to reduce automobile traffic congestion and improve automobile travel time,
d) to stimulate more transit usage and ridesharing,
e) to remove "spillover" parking by commuters in neighborhoods or retail areas,
f) to improve the utilization of existing parking facilities, thus reducing the amount of land, building area, or street space consumed in parking,
g) to promote economic growth by expanding short-term parking supply and increasing short-term space turnover, thus encouraging retail and other business activities,
h) to generate significant parking revenues that could be used for transportation or other uses,
i) to reduce long-term parking space requirements at major activity centers and on city streets,
j) to increase modal equity (by neutralizing parking subsidization) and encourage alternatives to auto use.

B. KEY POLICIES AND STRATEGIES

Exhibit 4 lists parking pricing policies and strategies that can be used to discourage automobile use and encourage transit use.

EXHIBIT 4

PARKING PRICING; TRANSIT SUPPORTIVE POLICIES AND STRATEGIES

1. Pricing of Parking Under Public Control

   1) Introduction/Increase of Parking Rates
      a) on-street parking
      b) off-street parking
   2) Parking Rates to Encourage Short-Term Use (shoppers, clients, tourists) and Discourage Long-Term Use (commuter parking)
   3) Reduced Rates for Preferred Vehicles (ridesharing, energy-efficient vehicles)

2. Economic Disincentives/Taxes to Modify Demand for Parking

   1) Parking Revenue Tax
   2) Parking Space Tax
   3) Parking Surcharges
      (ad valorem, based on hours parked, fixed amount)
      a) peak-period surcharges
      b) all-day surcharges

1. Pricing of Parking Under Public Control

1.1 Introducing/Increase of Parking Rates

1.1(a) On-street parking

Curb parking rates should be adjusted to more closely reflect the true economic value of curb space. It is essential that curb parking be more expensive than parking in adjacent lots (it reduces area cruising in search of parking). Implicit is the need for effective enforcement of curb parking, including appropriate penalties for parking violations.

Another way to introduce parking rates in on-street locations would be to implement parking permits or licenses. These are prepaid stickers needed to park in a specified area. Advantages: 1) All parking spaces in a given area can be controlled, thus making it impossible for drivers to escape charges by changing their parking spot. 2) Since the parkers would have to obtain the permits at government set prices, the facility operators would have less opportunity to absorb or redistribute the new user costs. 3) Parking permits can be targeted to certain places and time periods or types of parking in order to address specific problems. Disadvantages: 1) The inconvenience of getting a permit. 2) Distribution of permits would require some administrative activities. 3) The enforcement of a permit requirement would present significant new demands on enforcement agencies.

1.1(b) Off-street parking

Parking facilities should complement rather than compete with transit. This may call for more rational pricing of parking in congested large-city centers. For example, all day parking rates of $4.00 to $6.00 are certainly not consistent with 50 million dollars per mile rapid transit investments.

1.2 Parking Rates to Encourage Short-Term Use and Discourage Long-Term Use

Where adequate public transport is available, this policy is proven to help reduce peak-hour automobile traffic. It encourages peak-hour public transportation usage by work commuters without impending or discouraging automobile travel to downtown for other purposes. The inversion of rate structures needs public acceptance and support. Where considerable parking is under municipal control, cities have a better opportunity to influence overall rate structures. This strategy can be implemented twofold, local governments can change the prices and rate structures in the facilities they own or require/encourage the owners of commercial and private facilities to change their pricing.

1.3 Reduced Rates for Preferred Vehicles (ridesharing, energy-efficient vehicles)

The objective of this policy, of course, is to encourage travel by the preferred types of vehicles. It would be done by stipulating maximum rates at all or some types of parking facilities, with rates for preferred parkers being lower. While the overall impacts of pricing discounts may be unlike price increases, it is easier to reward certain types of "good" behaviour than to try to penalize large numbers of drivers. The constraint to this strategy is ensuring that the appropriate vehicles receive the price discount at non-attended facilities and at on-street meters. If discount parking permits are used there, a large degree of control and enforcement would be required.

2. Economic Disincentives/Taxes to Modify Demand for Parking

Economic disincentives, such as parking taxes, can be another demand management tool. By raising the cost of parking through applying taxes, jurisdictions will encourage automobile drivers to switch to other modes of travel, or to travel less. The advantage of the parking tax is that it can be targeted to particular groups whose travel behaviour is most critical to change. For instance, a parking tax can be applied more intensely to commuters travelling in the peak hour to help alleviate peak hour congestion.

A parking tax can be implemented in several ways. It can be imposed on the parking provider or directly on the parker. It can apply broadly to all parkers or narrowly to a specific group of parkers. It can be imposed on a jurisdiction-wide basis or to some narrowly defined geographic area. There are also alternative structures: the tax can be imposed as a fixed fee, as a proportion of the parking cost, or based on the duration of parking. These choices will determine the impact of the parking tax on transportation demand, market responses, ease of administration and enforcement, and public acceptability.

The revenue and mode switch potential from a parking tax is quite high if that tax is applied broadly. On the other hand, if the tax is applied only to commercial parking the effects on modal shift will be slight. There are two reasons for that. First, percentagewise, few urban automobile trips make use of paid parking (the majority has access to employer-provided parking). Second, those commuters who use commercial parking for work trips are not highly sensitive to the price of parking.

A parking tax directly affecting the parker has the greatest possibility to influence travel behaviour and encourage a shift away from the SOV mode. If entities such as parking operators or employers incur the tax, the impact on individual mode shift will depend on the extent to which the tax is passed on. Parking operators will most likely pass the bulk of a tax on to the individual parking user. However, they may change their fee structure so that the tax is incurred by other users than the commuters for whom it was intended. A similar situation may occur if employers are the ones who incur the tax. They will probably pass most of the cost on, but not necessarily to the people parking. For example, an employer whose parking is taxed may simply pass the additional expense on through lower salaries to employees or higher costs to customers. The connection between parking and receiving lower salaries or paying higher costs is indirect enough to severely limit the transportation demand management potential of such a parking tax. This suggests that when a parking tax is applied, even if it is directed at parking operators or employers, mechanisms may need to be developed to ensure that the parking user incurs the cost of the tax or at least becomes aware of it.

It is also important to consider revenues generated from a parking tax are allocated. If the revenues are allocated to transportation demand management measures, such as transit subsidies or ridematching programs, the tax can provide consistent impetus for mode shift from single occupant vehicles.

Much of the parking available to commuters is leased or owned by employers. Confining a parking tax only to parking for which the parker is charged reduces the effects of a parking tax. However, imposing a parking tax is difficult if parking spaces are provided as a part of an office space lease, in which no separate charge is identified. Two solutions to this problem are available, 1) a jurisdiction could make an estimate concerning the value of the parking that accompanies the lease of office space on the basis of surrounding market values, and 2) the jurisdiction could require by ordinance that parking provided with leases be identified separately.

In summary: The travel behaviour will change significantly only if a fairly sizable tax is applied to a

broad range of parkers. In order to prevent unequal treatment of retailers and employers around the urban region, it will be necessary that parking taxes be widespread and apply uniformly to all surrounding jurisdictions and shopping areas.

2.1 Parking Revenue Tax

This type of tax is levied as a percentage of parking revenues, typically in the order of 4-6% of the user parking fee but may go as high as 20%. It is usually applied to all parking facilities in a city, but may include only commercial parking.

Advantages:
- By increasing the commuter's costs it will encourage SOV drivers to become ridesharers or to switch to public transit.

Disadvantages:
- The higher parking costs could discourage short-term parking and adversely affect retail and other business activities.
- All people who park in facilities with no user parking fees will not be affected.
- There also exists some uncertainty as to how parking operators pass on or absorb some of the tax. Some operators may reduce the prices charged so that a certain percent tax would result in a smaller percent increase in the users cost. The operators could also reduce long-term rates relative to short-term ones. Both actions would defeat the purpose of the tax.

2.2 Parking Space Tax

In this case, a flat tax is levied on each space offered by all (municipal, commercial and private) or by selected operators.

Advantages:
- It would affect free and for-hire parking, would require hardly any extra recordkeeping by operators, and would be simple to enforce.
- It is possible to set higher rates in areas well served by public transportation.
- As well, a lower tax rate could be levied on spaces reserved for ridesharing vehicles.

Disadvantages:
- A space tax cannot be directed toward commuters or a particular type of parker.
- The tax might not affect how much the user pays for parking, depending on decisions by the lot owners.

2.3 Parking Surcharges

This is a fee based on the incidence of parking, rather than on revenues or on the number of spaces, and can be applied to either the operator or user of facilities. To target a certain type of parking, the surcharge can be applied only to those parking for more than a given number of hours or to those arriving before a given time in the morning. It main disadvantage is that
targeted surcharges are difficult to control, and evasion possibilities are numerous.

To be effective parking surcharges would have to be significant, in order to tip the balance of net commuting benefits away from driving alone to either ridesharing or using transit. This is evident from

the fact that many workers now drive alone into congested downtowns despite the high commercial parking charges. In addition, the surcharge would have to be applied universally because commuters are likely to simply shift parking destinations if surcharges are in place at only a few facilities.

Parking surcharges can either be peak-period or all-day fees.

2.3(a) Peak-period surcharges

The main objective of this type of surcharge is to provide a disincentive to commuters who drive and park in the CBD during the morning peak period, thereby freeing up parking spaces for midday use and increasing the likelihood that transit is used for the commuter trip to work. The surcharge needs to be substantial and cover a large area in order to result in a modal switch from cars to public transit. The case studies indicated that people much rather park in different areas or switch the time of entering a parking facility to avoid the surcharge period, then switch travel modes. Nonetheless, these studies also indicated that peak-period surcharges do cause changes in travel and parking behaviour (i.e. later commute times, switching to non-surcharge parking facilities or on-street parking meters). Peak-period surcharges ususally increase parking availability during the morning and early afternoon periods. Peak-period surcharges are usually in the form of a fixed-fee tax (described below).

2.3(b) All-day surcharges

Ad valorem tax - tax that is charged as a percentage of the parking fee. This type of charge is best when all types (including short- and long-term) of parking are being taxed and when the value of the parking can be determined.
A tax based on the number of hours parked - this type of tax is closely related to an ad valorem tax, but uses as its criterion the number of hours parked rather than the overall parking fee. This method offers the advantage of providing an additional disincentive to long-term parking users: it tends to provide a counterweight to the discounts that are often offered to longer term parking users. It tends to increase the relative tax on long-term versus short-term parking. This is consistent with transportation demand management objectives and does not discourage aprking for shopping.
A fixed fee tax - this type of tax is best when only long-term parking is to be taxed. Charging the same fee for one hour and eight hours would be perceived as unfair. In addition, it would discourage short-term parking more than long-term parking, which would be contrary to transportation demand management objectives. A fixed fee works well in situations where parking that has no identifiable value is to be taxed.

C. GENERAL CHARACTERISTICS OF THE PRICING OPTION

1. Primary variables in a parking pricing strategy:

a) **geographic coverage** - rather than blanket price increases throughout a local jurisdiction, prices could vary to reflect specific high density zones, specific problem areas, or the level of transit access.

b) **temporal coverage** - prices could be increased only during the peak hour periods, or charges could be raised for long-term parking only.

c) **level of fee** - experience indicates that rather large (more than 10 percent) price changes are necessary to achieve required objectives.

d) **type of facility** - pricing could be applied to all publicly and privately (non-residential) owned facilities, or to just one type of facilities (for example just municipal parking spaces).

2. Primary structures of the parking pricing:

The structures of parking prices can be designed in a number of ways, including:
- flat fees,
- uniform rates,
- block rates,
- mixed charges, and
- nonlinear prices.

All five structures are briefly described below.

A flat fee price structure charges a fixed amount regardless of parking duration. Since the average charges decline with parking duration, this structure encourages long-term parking. Thus, flat rates should not be imposed in places where the policy of favoring short-term parking is pursued.

A uniform rate price structure is linearly proportional to parking duration. The average fee for each increment of time is constant regardless of parking duration; this structure does not favor any type of parking user. Since the unit rates are the same for both long-term and short-term parking users, a general increase in parking rates will result in long-term users paying a larger increase than short-term users, and will therefore have the effect of discouraging long-term parking.

A block rate price structure charges a specified uniform rate up to a given amount of time, and another uniform rate after that. Two alternatives are possible here. If the hourly rate is lower in the first block than in the second block, it is a "convex-type" structure which favours short-term parking (since as parking duration exceeds some specific amount, the hourly rate increases). If the hourly rate is higher in the first block than in the second block, it is a "concave-type" structure which favours long-term parking (since as parking duration exceeds some specific amount, the hourly rate decreases).

A mixed price structure is a combination of two or more of the above-mentioned price structures, i.e. flat fee, uniform rate and block rate. Thus within this structure there is a number of possible variations. The idea behind a mixed price structure is to give incentive prices to some groups of users and disincentive prices to others. Which type of parker (long- or short-term) is favoured depends on the type of structures used and their sequence.

Nonlinear price structure has a rate schedule that grows nonlinearly with parking duration. Two alternatives are possible here. If the rate of change of the hourly fee increases with parking duration, it is a "convex-type" structure which favours short-term parking (since as parking duration increases the price increases more than proportionately). If the rate of change of the hourly fee decreases with parking duration, it is a "concave-type" structure which favours long-term parking (since as parking duration increases the price per unit of time decreases).

D. KEY ISSUES WITH RESPECT TO PARKING PRICING STRATEGIES

a. Factors which influence the effectiveness of parking pricing strategies:

Effects of pricing policies are not uniform in direction or magnitude. That is due to differences in site specific factors. The factors which have the most influence on pricing programs include:
- **locational characteristics**, such as alternative parking options, transit accessibility and magnitude of

the parking price. Low availability of adjacent parking opportunities (these include neighbourhood streets, adjacent commercial lots, vacant lots) encourages people to switch to non-SOV modes and thus makes pricing schemes more effective. Good transit services are an additional incentive to use non-SOV modes. The larger the parking price the smaller the solo-driving mode share.

- **travel characteristics of the workforce**, such as base level carpool shares and trip distances. High base levels carpool shares indicate propensity for additional carpooling.
- **socio-economic characteristics of the workforce**, such as income, sex and age. Generally, the lower income groups are more sensitive to parking rate increases.
- **employer controlled aspects**, such as size of workforce, level of parking subsidies and number of employer provided parking spaces. Generally, price increases will have more effect in areas where employers pay little, if any, of employee parking costs, compared to areas where employers subsidize most or all of these costs. The role of the employer in providing an effective parking pricing strategy is crucial, because the employer can influence whether or not, and how much, the employee has to pay.

Out of all factors the locational characteristics are most important.

b. The best candidate localities for pricing strategies:

Analysis of case studies resulted in the conclusion that pricing strategies are most applicable in localities where: a) the public supply makes up a substantial proportion of the total parking supply, b) there are not many opportunities for spillover parking (few retail or neighborhood areas with no pricing or parking regulation), c) transit into the priced zone has some capacity or will be improved, and d) some amount of parking pricing is already in place because it is difficult to impose prices if public or private parking is currently free.

Therefore, parking pricing as a mode split influencing device is most applicable in larger cities with high downtown development intensities and extensive transit service.

c. Cost effectiveness

While the direct costs of implementing parking pricing strategies are usually not great, the resulting economic and financial returns are generally substantial, both in terms of direct revenue as well as effectively reduced vehicle trip demand. Implementation costs will depend on whether a pricing action is merely a change in existing pricing or a whole new pricing scheme. Much also depends on whether or not pricing is packaged with other strategies such as expanded rideshare and transit services.

d. Parking elasticity

When fares are increased at parking facilities the patronage falls, as people either change mode for all or part of their journey, divert to alternative destinations, or combine activities into fewer journeys rather than pay the higher cost of travel. Elasticity is a measure of the change in demand relative to change in price. Elasticity takes a negative value when demand moves in the direction opposite to change in price. The high elasticities reflect the drivers' low perceived cost of diversion to the alternative parking places as compared to the difference between the before and now parking charges. Values between 0 and -1 mean that the proportionate loss in patronage is less than the proportionate increase in price, and that revenue will rise following a price rise. Negative elasticity greater than 1 means that revenue will fall after the price rise.

The response of demand to change in price depends on the shape of the demand curve, the size of the

change and the previous levels of demand and price. A demand curve describes the relationship between patronage and price for each identifiable market segment. Thus, a separate demand curve might be expected for each length of stay at each parking place. When, a demand curve has a convex shape (as is usually the case), elasticity is not constant but becomes higher (i.e. more negative) as price increases; the more convex the curve, the slower is the rate of change in elasticity. Along linear demand curve, elasticity changes quickly.

The incidence of price elasticity of demand for parking space offers the prospect of rational forecasting of user response to charges and subsequently setting charges at such level as to help decrease the SOV utilization to desired levels. As well, parking elasticities offer other potential benefits by indicating the extent to which it might be possible to induce parkers to redistribute their movement within periods of peak traffic congestion, principally through transfer to an alternative parking place, and in relating parking to public transport fares levels. It should be remembered here that the relationship between parking patronage and price is complex, and there are inherent conflicts in the implications for parking provision and operation from other policies pursued by local authorities, so that too much ought not to be expected from parking elasticities. What makes parking response so complex is the potential for redistribution of parking by length of stay, the trade-off of walk distance and parking fee, and possibility of a number of different car parks to offer a choice of price for the same stay.

Elasticity was revealed to rise sharply with length of stay. Research indicated that long-term parkers are much more sensitive to price changes (have higher elasticities) than short-term parkers. That is due to differences between commuters and short-stay users. Commuters face charges every day, and their hours of work constrain their ability to reduce the impact of a price increase through parking for a shorter period. Of course long-term parkers whose parking is either partially or totally subsidized would behave differently and have different demand elasticity for parking space than commuters who have to pay for their own parking. Analysis of several case studies of a number of price increases of different magnitudes showed that short-stay patronage recovers relatively quickly, and accordingly that future revenue and patronage can be predicted on the assumption that it is inelastic to price. The factors which influence the redistribution of parkers and the revenue gathered, and subsequently the price elasticity of demand for parking space include: a) the location of the parking facility and of competing facilities, b) the charges and their relative levels at all the car parks, and c) the parker's journey purpose and ultimate destination.

In the belief that elasticity increases with the size of the fare increase, it is recommended to use more frequent small rises, in line with inflation and other changes in their costs of maintaining services, rather than occasional larger increases.

E. IMPLICATIONS OF PRICING STRATEGIES

If parking pricing is to be introduced, the parking costs will have to be sizeable, since the relationship between parking demand and parking price is very inelastic - it takes a large price change to reduce parking demand appreciably.

The funds from parking fees should be used to improve public transit, bicycle paths and other non-SOV systems in the areas where they are collected. High parking fees would be more politically acceptable if those paying them believed the money was going to be used in that way, and not simply going to a bottomless "general revenue" account.

There is no overall clear conclusion of the effect that parking pricing may have on mode choice, since that is highly dependent on many local variables. Pricing will not always divert parkers to alternatives to solo driving. Parkers may well go to other parking facilities, or shorten their parking stay or switch among alternative modes or combinations of all of the above. But extensive research indicated that usually pricing programs do induce changes. How effective these programs can be has been proven by study which related trip reduction levels to the existence of that policy. The study concluded that 5 of 6 sites with trip reductions of over 30% had parking charges, as did 7 of the 9 sites with trip reductions between 15% and 30%. In contrast, 5 of the 7 programs with low trip reductions levels (less than 15%) did not have parking charges. There has been evidence that high transit use is associated with costly parking. San Francisco, with the expensive and low supply of parking has the transit share of 60%. Portland and Seattle where both supply limitations and parking charges have been implemented have transit shares of 43% and 45% respectively.

As a strategy encouraging modal shift away from SOVs, parking pricing has several advantages over policy of road tolls. First, it is easier to collect peak-hour parking fees than peak-hour tolls. Charging peak hour fees to cars moving on congested roads poses technical problems. But, collection of parking fees would not slow the movement of traffic. Persons who now park in free spaces provided by employers could be charged through their employers. Many commuters already pay parking fees, if they use parking during peak-travel times their fees could easily be raised. Second, parking fees would be levied against only some of the vehicles using roads during peak hours (which is usually the desired situation), whereas road pricing would charge all such vehicles. Long distance trucks or other vehicles making trips through a region during peak hours would not pay parking fees; so they would not be deterred from driving. Nor would such fees hinder drivers running errands that did not require long parking. Third, higher parking fees would penalize all peak hour auto commuters, but road pricing would only penalize those who used the roads peak-hour tolls were charged. So parking charges would in theory be more effective than road charges at discouraging peak hour commuting - especially if they were levied only against solo drivers.

CHAPTER 4 - TRAVEL ALLOWANCES

The idea behind travel allowance programs is to provide support to transit and carpool modes, and to offset the encouragement given to solo-drive mode through employer parking subsidies. But employers have pursued these programs under a variety of rationales. In some cases they were implemented as a measure to control parking costs. In others, introduction of allowances was due to expected enhancement of employer image and benefit of help in attracting and retaining employees. In many locations, the allowance programs have been realized as a direct result of pressures of meeting the requirements of transportation demand ordinances. In still other cases, the programs have resulted from pressures from employees interested in using transit or ridesharing and recognizing the inequity of the traditional parking subsidies.

A. CRITIQUE OF CURRENT TRANSPORTATION POLICIES

1. The issue of interdependence.

Huge subsidies are provided to public transit systems in an effort to keep fares low enough to attract commuters out of their automobiles. At the same time most commuters receive even larger subsidies in a form of free parking at their work places. This uncoordinated pricing of transit and automobile alternatives merely corrects for inefficient and inequitable subsidies to one mode by adding inequitable and inefficient subsidies to others. The interdependence of policies for the different elements of transportation system is not recognized, which caused transportation policies to be incoherent, inefficient and inequitable.

Because the transportation policies are interdependent, it is futile to attempt to raise subsidy levels for alternate modes in order to offset automobile travel. Even extremely high subsidies for travel by transit or other "high occupancy" modes will not suffice to offset the powerful inducement to drive that is now offered by exempting the value of employer-provided parking from income taxation. This statement is supported by the U.S. experience of the 1980s. During that time, government outlays to promote expanded transit service and lower fares totalled nearly $100 billion, while the decline in transit's relative importance as a means of commuting and the dramatic growth of automobile travel both continued unabated.

Only if logical and non-each-other-counteracting policies are adopted, substantial changes in travel patterns can be realized.

2. Policy of employer-paid parking.

Employer-paid parking significantly lowers the cost of commuting by car and thus encourages commuters to drive to work alone. To believe the above statement it is enough to consider how much a parking subsidy reduces the total cost of driving to work. As an example, Willson and Shoup should have estimated that in Los Angeles the employer-paid parking reduces the cost of driving alone to work from $6.07 to $1.75 per day. To further prove the case, the finding made by Donald Shoup is listed herein. He analyzed several cases in a vicinity of Los Angeles and found out that, on average, employer-paid parking increases the number of cars driven to work by 37%. When the components of cost are compared, the value of a parking subsidy is almost always much greater than the value of the gasoline needed for the trip. Thus, provision of employer-paid parking is a greater incentive to drive

alone than an offer of free gasoline.

Although employer-paid parking may appear to be a generous and positive policy, by being a strong incentive to drive to work alone, it works at cross purposes with public strategies designed to reduce traffic congestion, energy consumption and air pollution. Also, this policy is unequitable and unfair. It fails to reimburse employees who commute by public transit for even the nominal fares they incur. Thus, free parking benefits only those who drive to work, and does even that unequally because it disproportionately rewards solo drivers. For example, a solo driver and a three person carpool both benefit from free parking at work, but the solo driver gets three times the parking subsidy each carpooler gets. As well, parking subsidies tend to benefit higher income groups, because of the distribution of subsidies and the effects of tax law. Employer-paid parking is, in effect, a form of wage discrimination in favor of employees who drive to work. The motivation for this is that employees who drive to work can choose among a larger number of employers than non-driving employees can.

The employer-paid parking is extremely widespread because of the way the tax law is set up. The income tax exemption on the value of free parking supplied, but not on the cash subsidy, strongly encourages employers to provide employees with free parking rather than the cash value of it.

In order to make modes more equal, employer-paid parking has to be deleted. Its value is such that if it is not deleted, it would continue to encourage suburbanization and increasing travel volumes, inspite of increased transit subsidies.

B. KEY POLICIES AND STRATEGIES

Policies which try to make the system more equal, i.e. counteract unfair encouragement given to solo-driving through employer parking subsidies:

EXHIBIT 5

TRAVEL ALLOWANCES AND RELATED TRANSIT-SUPPORTIVE POLICIES

1. "Cash-Out" option require employers to offer employees option of taking fair market value of parking subsidy as taxable cash travel allowance)
2. Replacing Employer-Subsidized Parking with Travel Allowances for Every Employee (tax exempt in U.S.)
3. Reclassification of Employer-Provided Parking as a Taxable Fringe Benefit
4. Tax Exemption of Employer-Provided Transit Passes (already in existence in U.S.)

1. The "cash-out" option

This option proposes to require (either by local ordinance or by the internal revenue code) of an employer who provides subsidized parking, to offer an option to take the fair market value of the parking subsidy as a cash travel allowance. Thus, as a result of this policy, the employee has a final choice as to either cash or a subsidized parking spot. This option provides commuters an incentive to use non-SOV modes even if they are offered a parking subsidy.

The advantages of this policy are numerous. First, no employee is faced with the loss of an existing

parking subsidy, and he/she has an additional option for consideration, that is a cash alternative. Second, offering commuters the option to choose between cash and a parking space makes it clear that parking is not free. Therefore, all employees, even those who are offered free parking at work, would begin to consider the cost of parking as an important factor in deciding how to commute to work. And research has clearly demonstrated that the cost of parking profoundly influences commuter's mode choices. The available option of cash instead of a parking place would be a strong incentive to ride transit, rideshare, bicycle or walk to work. Third, this alternative has a potential of reducing traffic congestion, air pollution and gasoline consumption. How so? Because it allows alignment of a commuter's travel choices more closely with their own preferences. Employer-paid parking is often a take-it-or-leave-it offer. Therefore, some employees who value the parking at less than the cost to the employer of providing it will nevertheless take the parking subsidy rather than nothing. Fourth, it is not costly or difficult to implement; therefore it would cause minimal inconvenience to employers. Fifth, presence of this requirement promotes more equitable treatment of all employees with respect to subsidizing their travel to work. And six, this requirement would make it difficult for employers to continue any existing favoritism towards employees who drive to work.

The main disadvantage of this proposal is that it is quite narrow in scope. It may not cover enough driving workforce to be effective in a significant way. Another disadvantage has to do with the fact that the choices it provides are not equal in value. The cash travel allowance is taxable whereas the parking subsidy is not. The employee decision as to the travel mode would be biast towards solo-driving on account of that inequity. Therefore the taxability of a cash payment reduces the effectiveness of offering the cash alternative as an incentive to use transit or some other non-SOV mode.

2. Replacing employer-subsidized parking with tax-exempt travel allowances for every employee

This option calls for amending the tax code in such a way that employers can classify some limited amount of each employee's gross earnings as a tax-exempt travel allowance subject to the condition that the employer did not also offer free or partially-subsidized parking. Such an allowance can be used by the employees toward any mode they choose or for any non-transportation purposes (including salary boost substitutes for parking or transit subsidies).

The advantages of the commute allowance proposal are that: 1) it effectively raises the price of parking to the full market price of parking, 2) it treats all employees equally by allowing all the same tax exempt commute allowance, 3) it helps recognize that commuting to work is a cost necessarily entailed in earning an income, yet it allows employers to compensate for this cost without encouraging them to commute by automobile and 4) it would be more popular than policy of taxing the value of parking subsidies because it would offer employers more choice. Any employer could continue to offer employees tax-exempt free parking and not offer them the tax-exempt commute allowance if he/she so chooses. Yet the employees would be motivated to ask why the employer offers subsidized parking if a more equitable alternative is possible.

Two disadvantages of this proposal are that it would reduce federal income tax revenue, and that it can be implemented only by the federal government.

3. Reclassifying the employer-provided parking as a taxable fringe benefit

Present tax law specifies that employer-provided parking is a non-taxable fringe benefit. If that law is

changed and parking cash value is required to be estimated and reported, the primary motivation for employers to provide parking would be eliminated. This in turn would lead to the end of the practice of employer-paid parking, and would cause commuters to face the full market price of parking in their commute decisions. And that would be an even greater incentive to use transit or to rideshare than offering commuters the after-tax market value of their current parking subsidies.

The main disadvantage of this policy is fact that it is politically difficult to begin taxing a long-standing fringe benefit that so many commuters enjoy. An additional disadvantage is the doubt that the elimination of the tax-exemption of employer-paid parking would in fact lead to the total elimination of employer-paid parking. Some employers might well continue to offer free parking in order to attract those employees who would drive to work even if they have to pay for their parking. This doubt is due to the existing trend of wage and other privileges discrimination in favor of employees who drive to work and are thus able to choose among a wider array of employment options. Due to many options that these employees have, the employers have to work harder to interest these employees to work for them.

4. Increasing the current tax exemption of employer-provided transit and carpool subsidies

The inequitability of value of transit/carpool subsidy to value of parking subsidy is the main reason for failure of the first to produce any changes in modal rates. The two would have to be approximately equal to hope for any visible results.

Until recently transit subsidies in the United States were tax exempt from federal income tax only up to a value of $15 a month, and if the subsidy exceeded $15 the entire value was taxable. That value compared to $80 or $100 of parking subsidy offered by an employer was explanation enough to understand why employees would not switch modes from SOV driver to transit to take advantage of the transit subsidies. At present the transit subsidies are tax exempt up to a value of $60 a month, whereas parking subsidies are tax exempt up to a value of $150 a month.

The main disadvantage of this policy is that it is unknown if increased transit/carpool subsidies are actually going to achieve substantially more widespread use of non-SOV modes as long as free parking is also offered. Substantial empirical evidence suggests that commuters' decisions to drive are extremely insensitive to reductions in transit fares, which suggests that it is virtually impossible to lower current transit fares sufficiently to induce significant numbers of auto commuters to switch to transit.

C. KEY ISSUES WITH RESPECT TO TRAVEL ALLOWANCE PROGRAMS

a. The role of the employer is crucial, because the employer influences the effectiveness of travel allowance programs, by level of efforts which he puts into advertisement, promotion and distribution of these programs.

b. Monitoring requirements with respect to travel allowance programs should include ensuring that designated carpools are legitimate and remain so, and preventing misuse and transfer of subsidized transit passes. General travel allowances, because they carry the least amount of restrictions, are the easiest to monitor.

c. Tax consequences. A principal concern with travel allowances pertains to their tax consequences. From the standpoint of employers, the tax consequences are uncomplicated: cost of

travel allowances are fully deductible as business expenses. From the standpoint of employees, the tax consequences may seriously limit the benefits of these programs. Employer-provided transit or ridesharing subsidies are tax free to employees only if the amount is $60 or less per month per employee (and up until recently that amount used to be just $15). If the subsidy is greater than $60 per month, the entire amount (not the portion above $60) is considered as taxable income to the employee. In consequence, a parking subsidy of more than $60 per month is much more attractive from an employee's perspective (since it is non-taxable) compared with an equal transit or ridesharing allowance. An unrestricted general travel allowance that an employee can use for any purpose is even more disadvantaged. By present taxation laws it is considered fully taxable income to the employee, regardless of the amount. Therefore, due to tax implications travel allowances might seem less attractive to employees than parking subsidies even though they are more equitable and bring more benefits to the community.

d. Factors influencing which allowance type is to be chosen. A general travel allowance program was observed to work better at employment sites where parking availability is at a premium, the existing parking subsidies are high, and where there is considerable pressure to reduce solo driving significantly. Also, the surrounding parking market should have rates comparable in magnitude to the allowance to be charged. Where the goals of shifting employees to ridesharing are more modest and where parking is neither in short supply nor expensive, specific travel allowances (i.e. transit or ridesharing allowances) make more sense.

e. Allowing building owners and employers to phase into travel allowance programs is a reasonable way to get support for these program. It enables both employers and employees to adjust to the new conditions and recognize the advantages of the allowances.

f. The allowance programs can be successful only when it is financially worthwhile for those who switched modes.

g. Impacts of travel allowance programs. Evaluation of case studies showed that transit and ridesharing allowances by themselves have only a slight impact on modal shares at employment sites. But if packaged with other TSM measures like information dissemination, preferential parking for carpools, and on-site transportation co-ordinator, such programs have reduced solo driving mode shares up to 10%. Even greater reductions in solo driving shares (up to 30%) have been achieved at employment sites where transit and ridesharing incentives have been used together with parking charges for solo drivers or subsidy reductions for employee parking (K.T. Analytics 1989, "An Assessment of Travel Demand Management Approaches at Suburban Activity Centers"). Although much of the decrease in solo driving came from parking charges and subsidy reductions, it was observed that availability of travel allowances was a significant incentive towards changing travel modes; i.e. composite programs containing travel allowances had substantially better results than programs without travel allowances. Therefore the implication here is that travel allowances when coupled with other programs are working well because they provide an additional encouragement to switch modes, but by themselves they are not adequate to cause many changes.

h. Costs of implementing travel allowance programs. Significant variability has been observed in the costs of transportation allowance programs depending on the type of the program and its complexity and the amount of allowance offered.

General travel allowance programs require considerable planning and promotional efforts during the preimplementation phase, but once they are installed the ongoing administrative costs are relatively

small. The accounting costs are also negligible once the program is set because the allowance is given out to all employees as a bonus. The only significant cost to the employer is the cost of the allowance itself, although in most cases this is partially offset by the new parking revenues from solo drivers or from the reduction in parking subsidies to solo drivers.
Specific allowance programs such as transit and carpool allowances require some on-going administrative effort to monitor eligibility requirements and accounting as the employee base changes. These costs have been estimated to be in a range of $5,000 to $10,000 per year (these figures are from late 1980s). The allowance itself would be extra.

More complex programs such as those with different allowances for different modes and occupances would cost more because of greater administrative, monitoring and accounting needs (these costs have been estimated to be in a range of $10,000 to 20,000 per year). But the actual allowance costs of a mode-specific program would probably be lower than for a general travel allowance program, because only a fraction of employees are eligible to receive them.

i. The evidence from case studies indicates that successful promotion of ridesharing and transit use among employees is critically dependent on existing pricing policies. The presence of parking subsidies counteracts the efforts to promote non-SOV modes.

CHAPTER 5 - CONCLUSIONS

This report has reviewed a considerable number of references that address parking policies that might discourage commuting in single occupancy vehicles (SOVs), and encourage the use of more sustainable modes, such as public transportation. Exhibit 1 outlined the list of transit-supportive policies that were identified based on the review of this literature.

Challenges:

It is clear from this review that parking pricing and availability are critical factors in influencing mode choice. However, it is also clear from the review, that changing parking policies will be extremely difficult. There are several specific challenges that will need to be addressed to pursue any of the policies identified and discussed in this report.

- **How to Address the Primary Target (i.e to discourage commuter parking)?** Parking policies are complex and have been established in order to address many different issues (e.g. access and mobility, safety concerns, congestion issues, economic viability and competition, quality of neighborhood life, etc.). It will be very difficult to design new parking policies that only discourage commuter parking, without affecting, or even just appearing to affect, other issues of concern.

- **Fairness?** The reliance on automobiles is so fundamental in North America, and their use so pervasive, that any policies restricting (or even just discouraging) their use will immediately raise issues of fairness. Why should non-auto users be favored? Why should one category, or geographic area, of auto users be treated differently than others? Recent initiatives by opponents to open up HOV lanes illustrate the sensitivities, and parking policies may be even more challenging.

- **Impact on Inter-Municipal Competition?** Given the often intense competition between different municipalities in a same region, it will be extremely difficult for one jurisdiction to impose new parking supply restrictions, or parking fees, if adjacent jurisdictions do not. Local chambers of commerce are quick and vocal to point out the potential impacts on economic competitiveness. There is also concern about the longer-term implications of such policies, in that they may contribute to "business flight" to the suburbs. Unfortunately, few urban regions in North America are equipped with the institutions that make feasible the development of consensus around a region-wide sustainable development vision, with enforceable regional policies.

- **Require Legislation?** From a practical point of view, many of the policies discussed here require either federal legislation, such as tax code changes, or provincial/state legislation, since cities are generally "creatures" of the provincial/state level, and have few inherent powers. This may affect the ability to levy municipal parking taxes, even if a city desired to do so: this

may make many of these policies more difficult to pursue.

- **Administrative Ease and Enforcement?** Administrative ease and enforcement will also be important considerations in the pursuit of many of the proposed policies.

- **Political Will?** Finally, much of this discussion boils down to the issue of political will. It is clear that changes to parking policies can be powerful tools, but as a result, they are also likely to be controversial ones. Political will be a critical component element in most cases; there will be an important challenge to articulate the need, build the consensus, and find the leaders with the political will to pursue these policies.

Recommended Areas for Further Research:

The challenges are clearly substantial, but the tools that have been discussed in this report have great potential for developing more sustainable patterns of regional mobility. This study was the first step to look at the potential development and implementation of transit-supportive parking policies. Actual experience remains fairly limited to date, and has not been fully explored through the literature. In light of this, the study recommends three areas for future action:

- **Explore Actual Local Experience:** Identify and document municipalities or regions that have taken concrete steps to implement transit-supportive parking supply or pricing policies/strategies, and explore the effectiveness of these actions.

- **Develop Model Policies:** Based on the above research, develop model policies and wording for the most promising areas to pursue, that would facilitate their pursuit by municipal politicians and staff.

- **Explore the Specific Issue of Conversions to Single Use Parking Facilities:** One area that has received little attention is that of conversion, in particular in times of economic constraint, of lots into parking. Land owners may see great advantages to paving over land that cannot be economically developed in order to develop a source of revenue through commercial parking. In some cases, existing buildings may even be demolished for this purpose. Such situations move in the opposite direction of what this study suggests is desirable, but create very difficult situations for municipal politicians and staff. This common problem merits particular attention.

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APPENDICES:

REVIEW OF THE LITERATURE RELATED TO TRANSIT-SUPPORTIVE PARKING POLICIES

APPENDIX A LITERATURE ON THE MANAGEMENT OF PARKING SUPPLY

APPENDIX B PARKING PRICING LITERATURE

APPENDIX C TRAVEL ALLOWANCES LITERATURE

APPENDIX D PERTINENT REFERNCES IDENTIFIED SINCE THE INITIAL PUBLICATION OF THIS STUDY

APPENDIX A - LITERATURE ON THE MANAGEMENT OF PARKING SUPPLY

Bhatta, K. (1990), "Local Zoning Codes and Parking Supply". Proceedings of the Commuter Parking Symposium, Dec.1990. U.S. Department of Transportation.

Minimum and maximum requirements, flexible requirements, parking caps.

General paper. The article lists possible parking supply policies. It also describes the conditions that need to be present to increase the effectiveness of above policies and to realize high reductions in auto use. The paper briefly touches upon which strategies are best for which areas, and deals with the key issues with respect to changing and/or implementing parking supply policies. The last section is a summary, which contains the author's recommendations as to how, and where to apply parking supply strategies.

Blankson, C. and Wachs, M. (1990), "Preliminary Evaluation of the Coastal Transportation Corridor Ordinance in Los Angeles". Transportation Research Record No.1280. Transportation Research Board, pp. 39-45.

Flexible requirements.

Case study: Los Angeles (California), 1988-1989. Evaluation of the success of travel ordinances (in this case developer requirements) in reducing the number of work trips and changing modal split.

Strategy: Requirement on any new nonresidential development generating more than 100 trips in the afternoon peak period to include measures that will reduce trip generation by at least 15%. Thus, the real estate developer is forced to pass along to the tenants (through rental agreements) mitigation measures like: ridesharing programs, preferential parking for carpoolers, bicycle parking facilities, higher parking fees and smaller proportions of free parking.

Method: The evaluation consisted of comparing the travel behaviour of workers employed in buildings affected by the ordinances, with the travel behaviour of workers in buildings not covered by the mitigation measures.

Results: Authors concluded that travel ordinances through developer requirements have had a very small impact on workers' travel decisions. The results showed that developers affected by the ordinance are significantly more likely to include preferential parking for carpoolers in their projects and some bicycle parking facilities as well. The companies affected by the ordinance offered free parking to a substantially smaller proportion of their employees, and charged higher than normal rates to those remaining who pay to park. But, the provision of these facilities and higher parking fees have had small initial effect on workers' decisions to drive to work alone. The modal split of the affected group was found to be similar to the modal split of the control group. The only significant effect was a tendency toward higher rates of carpooling among workers at firms with the mitigation measures. The affected group had twice as many carpoolers as the control group, but the carpoolers were a small fraction of the workforce. The proportion of workers driving to work alone was the same in both groups.

Thus, ordinances have not appeared to make any substantial difference in the proportion of workers driving to work alone.

DiRenzo, J.F. et al (1980), "Overview of Implemented Parking Management Tactics". Transportation Research Record No.786. Transportation Research Board, pp.1-9.

General paper. This article reviews and evaluates several parking management tactics. Six categories of parking strategies are identified by the author: a) on-street supply, b) off-street supply in activity centres, c) pricing, d) enforcement and adjudication, e) fringe and corridor parking, and f) marketing tactics. The first four categories are discussed in detail. The article also reviews policies that offer incentives for multi-occupant-automobile travel and short-term parking for shoppers. As well, parking tax surcharge policy is evaluated.

Only a part of this article is relevant to this topic.
Zoning strategies discussed in the article:
A. Zoning requirements
- stricter maximum and lower or no minimum parking requirements
- joint use of parking
B. Constrain normal growth in supply
- maximum ceiling (i.e. freeze) on CBD supply
- reduced minimum parking requirements through HOV and transit incentives
- restrictions on principal-use parking facilities
C. Carpool/Vanpool Preferential Parking

Flynn, C.P. and Glazer, L.J. (1989), "Ten Cities' Strategies for Transportation Demand Management". Transportation Research Record No.1212. Transportation Research Board, pp. 11-23.

Flexible requirements

This paper documents transportation strategies used in several cities to accomplish transportation demand objectives. The article consists of ten case studies organized by community. They are: Irvine, Pleasanton, Los Angeles and Sacramento (all in California), Bellevue and Seattle (both in Washington), Portland (Oregon), Dallas (Texas), Orlando (Florida), and Montgomery County (Maryland). For each case study, the strategy (or strategies) used is identified, described and evaluated; background information on the community and its transportation problems is presented.
Only a part of this article is relevant to this topic.

Case study 1: Seattle, Washington.
Strategy: Developer requirements: a) building tenant participation (put in the lease agreement), b) must introduce one or more of following ridesharing incentives - higher parking fees for single occupant vehicles, high occupancy vehicle cost subsidies, carpool bonuses, transit pass subsidies.
Experience to date: Planners believe that the developer requirements program is working well.

Case study 2: Montgomery County, Maryland.
Strategy: Developer requirements: must prepare a 10-year plan for a TDM program. Must achieve certain trip reduction goals and give the county an irrevocable letter of credit equal to the cost of implementing the program for 10 years. Each year the TDM program is successfully implemented, the value of the letter of credit is reduced by 10%. Developer incentive ordinance: developers are allowed a 15% reduction in required parking if they participate in the county's Share-A-Ride program and also submit a written agreement with the following conditions: a) will designate a transportation coordinator to promote TDM activities at the site, b) will provide preferential parking for carpools and vanpools, c) will make an annual payment to a public fund that provides Share-A-Ride services, d) will report semiannually on progress and, e) will pay a penalty in the event of noncompliance. Comprehensive employer ordinance: Requirements for new and existing employers to obtain a 1.3 vehicle occupancy for all employees, and to achieve a level of transit use equal to 25% (for existing employers) and 30% (for new employers). For new

employers these requirements are to be strictly monitored and penalties exacted if goals are not met. Transportation fees: the fee is meant to defray a portion of the road construction costs necessitated by the additional traffic generated by the development. The amount of the fees varies to account for the relative trip impacts of different land uses and the relative needs and costs of supporting roads.

Experience to date: developer requirements and incentive ordinance - thought to be successful tools, work well. Comprehensive employer ordinance - no experience yet.

Case study 3: Sacramento, California.
Strategy: Developer requirements: a) single occupant vehicle usage to be decreased by 35%, b) TMP to be filed annually. The plan must document the commute modes of all employees, progress toward attainment of the 35% goal, and if the goal has not been met, the implementation of additional TDM measures, c) implementation of one or more of TDM measures - preferential parking, parking fees, transit passenger shelter, transit subsidy, and land dedication for transit facilities. Incentive ordinance: allows substitution of required off-street parking spaces for the provision of incentives to use other than SOV mode of transport. The most often used incentive: 5% reduction in parking or 20 spaces (whichever is less) for 50% transit bus pass subsidy.

Experience to date: developer requirements - no experience yet. Incentive ordinance -planners believe that it needs to be revised. The primary problem is that the ordinance is complicated, also that developers are reluctant to build below traditional levels of parking.

Case study 4: Bellevue, Washington.
Strategy: Developer requirements: a) post rideshare and transit information, b) provide transportation coordinator, c) provide preferential parking, d) provide financial incentives to employees, e) submit a report once a year which describes each of the required TDM components that were in effect for the previous year, the expenditures for financial incentives, the number of bus passes sold and the number of registered carpools.
Experience to date: the program is thought to be relatively successful.

Case study 5: Orlando, Florida.
Strategy: Incentive ordinance: A developer could avoid the construction of up to 20% of required parking in exchange for contributions to a transportation management trust fund. Contributions based on 80% of construction cost for each space avoided, with the "cost" of a space set periodically by the city council. Transportation fee: new developments are required to pay for the road and related infrastructure needed to accommodate the vehicular trips to be generated.

Experience to date: incentive ordinance not successful - developers leery of proposals to design less than "adequate" parking for office and mixed-use buildings. In suburban markets, developers believe that below-standard parking facilities detract from a project's appeal to office tenants. Additionally, although parking facilities are an expensive investment both in terms of construction costs and the valuable land consumed, they are also considered to be a permanent fixture to the property that is an asset with a quantifiable value under traditional appraisal methods.

Case study 6: Dallas, Texas.

Strategy: Developer requirements: a) dedicated rights-of-way for public use, b) financing off-site road improvements through a 50-cent-per-square-foot development impact fee, c) reduced maximum parking limits, d) special provisions for transit (such as easements for a bus transfer station and erection of bus shelters) in return for FAR bonuses, e) participation in a TMA including paying 5 cents per square foot toward its operating costs.
Experience to date: very little activity because of economic downturn.

Case study 7: Los Angeles, California.
Strategy: Incentive ordinance: reductions in parking requirements of up to 40% for on-site or 25% for remote parking are authorized if supported by a parking management plan submitted with the application for a conditional use permit. To protect against the possibility that projected reductions in parking demand at the site are not achieved, the land owner must set aside a land bank. The owner must sign the agreement that if specified levels of compliance are not achieved, he will develop additional parking spaces or other measures required by the zoning administrator. Developer requirement: within the area specified under The Coastal Transportation Corridor Plan (parts of Venice, Mar Vista, Westchester, Marina del Ray and Playa del Ray) developers of land uses that will generate over 100 peak-hour p.m. trips are required to develop and implement a TDM program that will reduce peak-hour trip generation by at least 15%. Transportation fees: Developers are required to pay a transportation impact assessment fee of $2,010 per peak-hour p.m. trip projected. Developers may reduce their assessed fees by up to 25% by implementing programs that will reduce the number of vehicle trips to be generated by the proposed development. Developers who do not follow through with their TDM programs are to be assessed a nonconformance fee of up to $6,030 per trip. Rideshare ordinance: all the employers with over 700 employees at one work site were to attempt to achieve an average vehicle ridership of 1.5 persons per vehicle (1.75 in downtown Los Angeles).

Experience to date: Incentive ordinance used by only one developer since its adoption in 1983, thus not working too well. Transportation fees - too early to judge the impact of this ordinance.

Foster, M. S. and Eastman, C. R. (1993), "Parking and Public Transport - The Effect on Mode Choice: a Study of B1 Developments". Traffic Engineering + Control, Vol. 34, No.10, pp. 480-485.

Parking restraints.

Contents: This article provides the results of the analysis undertaken to see if there were any effects of parking restraints on mode choice. It also presents the author's views of the effectiveness of demand management policies.

Strategy: Survey sent out to some 23000 employees representing 59 separate sites in the vicinity of Bournemouth, Dournmouth, Brighton and Harrow (Great Britain).

Results: With respect to relationship between modal split and the availability of parking, the analysis indicated no significant correlation. It was noted that the results may not be correct due to presence of following two factors: 1) only 15 of the sites experienced any form of parking restraint and where these provisions existed they were very slight, 2) the assumption to consider parking provision to be solely a function of parking that occurs within the site is unrealistic since there is frequently free on-street parking that is usually just as accessible as that within the site.

Conclusions: The method of reducing travel demand by using parking restraints seems to be limited. The problem with it is that it cannot be applied restropectively to existing offices and

most companies have the option of avoiding locations where such restrictive policies might be applied. In addition, the ability to seek low parking provision within developments is severely restricted by a chain of separate interests involved, these being the developer, the financial institutions and the tenant. The first may be prepared to accept low parking provision, but this is no guarantee that the next two will be prepared to accept the same restrictions.

Higgins, T.J. (1993), "Parking Requirements for Transit-Oriented Developments". Transportation Research Record No.1404, Transportation Research Board, pp. 50-54.

Minimum and maximum parking requirements.

Contents: This paper presents a method for setting parking requirements for office, commercial and industrial developments in proximity to transit stations and stops. Author demonstrates the method using employee survey data from the city of San Diego.

Strategy: The basis for establishing maximum requirement is the bottom level of usage of transit, walk and carpool modes. The basis for setting minimum requirement is the top level of usage of above modes. The method relies on annual employee transportation surveys of the kind typically required under trip reduction ordinances.

Method: Steps in obtaining high and low parking requirements:

1. sample of employers is drawn from the whole data base.
2. each employer from the sample is assigned to a matrix on a basis of proximity to transit (within and outside 0.25 mile of a transit trunk line) and land use (office, commercial and industrial).
3. for each employer, respective employee mode shares are entered.
4. for each employer in the array, for every mode except SOV trips, only the lowest and highest percent mode shares are left out. SOV shares then make up the balance after all alternative mode shares are subtracted from 100%.
5. the low and high mode shares are translated into low and high parking demands. Parking demand is estimated for each mode. High use of transit, carpools, vanpool and walking means low SOV driving and low parking demand.
6. the total low and high parking demands are estimated using a range of employee densities found in land uses (office, commercial and industrial). The resulting low and high demands expressed in parking spaces per 1000 sq ft represent the minimum and maximum parking requirements.

Conclusions: The article finishes with the statement that the method must be used with reason and caution. Before the requirements are implemented the following factors should be considered:

a) site variables. A building may be close to transit but there may be barriers to transit access. Thus the transit usage here will be lower than at comparable developments.

b) peak holiday demand. The guidelines for commercial parking demand are derived for peak weekend demand, but not for holiday demand. An important consideration is the degree to which holiday demand is to be accommodated.

c) shift changes in industrial uses. Because of shifts an overlapping demand may be created.

d) employee density (parking demand is quite sensitive to employee density).

Higgins, T.J. (1990), "Guidelines for Developing Local Demand Management or Trip Reduction Policies". Transportation Research Record No.1280. Transportation Research Board, pp. 11-21.

Flexible requirements, restrictions on access to commuter parking.

General paper. This article reviews important issues with respect to development and

implementation of transportation system management (TSM) strategies and parking management (PM) strategies. The issues considered include:
1. Conditions influencing the effectiveness of TSM and PM policies. The conditions considered were: the degree of through traffic, size and nature of employers, management capability and program resources, importance of parking pricing, and the role of exogenous variables. Based on what conditions are present, recommendations are made about when TSM and PM strategies are appropriate to consider.
2. Type of policy instruments used to encourage implementation of PM strategies. The policy instruments described in the article included ordinances, developer agreements, special permits and parking code provisions.
3. Design concerns with respect to policy instruments. The concerns considered in the article were applicability of the policy; specificity of requirements; types, uniformity and stringency of goals; nature and timing of plan requirements; when and how to enforce; types of exceptions; types and purposes of fees and financing.
4. Implementation. Within this topic the following issues were discussed: management and organization, monitoring, program costs, program financing, enforcement and legality, parking management implementation.

TSM strategies include preferential parking for carpoolers; promotions for transit, carpooling, bicycling, walking and flextime; designation of transportation coordinators at employment sites; and shuttle service to and from park-and-ride lots. PM strategies include imposing or raising existing rates at public facilities, imposing parking taxes at commercial facilities, reducing employer subsidies for employee parking, revising the supply of long-term parking through new maximum requirements in zoning codes, allowing reduced supplies of parking in return for in-lieu fees or implementation of TSM strategies, and other measures aimed at the provision and management of parking spaces for purposes of reducing solo driving.

The conclusions and recommendations of this article are based on evaluation of several case studies.

Higgins, T.J. (1989), "Parking Management and Traffic Mitigation in Six Cities: Implication for Local Policy". Transportation Research Record No.1232. Transportation Research Board, pp. 60-67.

Parking caps, flexible requirements.

In its first section, this paper documents transportation strategies used by several cities in order to discourage solo driving and encourage transit, ridesharing, cycling and walking. The article consists of six case studies organized by community. They are: Portland (Oregon), Seattle (Washington), San Francisco and Los Angeles (both in California), Denver (Colorado), and Hartford (Connecticut). For each case study, the strategy (or strategies) used is identified, described and evaluated; background information on the community and its transportation problems is presented. This paper focuses on such policies as parking code requirements, encouragements for fringe parking, preferential parking for carpoolers and developer requirements.

The second section of this article contains a brief review of peripheral parking literature. The third and last section is a summary with policy implications for localities.
Only a part of this article is relevant to this topic.

Case study 1: Portland, Oregon.
Strategy: Parking cap. The city fixes the number of allowed off-street and on-street parking

spaces with the intent of limiting automobile use. The current maximum is set at 43,914 (1988 figure). Hotel and residential parking is not counted in the controlled supply. The limit includes spaces in several approved projects that are not yet built. Proximity to transit is taken into consideration when setting this limit. Requirements in most areas are 1.0 space per 1000 sq ft of development but range to a low of 0.7 spaces. There is no minimum requirement except for residential uses. Other strategies: carpool and transit programs, preferential parking fees for carpools.

Experience to date: The city is generally satisfied with the parking limit and believes it has helped maintain high transit usage (between 43 to 48% modal split for transit in the last few years). There is some concern that maximum parking requirement has been set too high - many developers have provided considerably less than the maximum.

Case study 2: Seattle, Washington.
Strategy: The city imposes a maximum requirement of 1.0 space per 1000 sq ft. Minimum requirements are also established, they vary by proximity to transit (for example, if close to transit, the minimum for office is 0.54 spaces per 1000 sq ft; if moderate access to transit, it is set at 0.75 spaces). At least 20% of parking spaces provided to meet the minimum must be reserved for carpools. Ordinance incentives: a) reduction in parking requirement by 15% if free transit passes will be provided for at least 5 years, b) the long-term parking requirement may be waived, up to 100%, if an in-lieu financial provision is made.

Experience to date: Mixed feelings. On one hand, belief that above parking policies have helped maintain the high transit share for downtown commuters. On the other hand, considerable developer opposition exists to carpool set-aside space allotment. Also, very few developers have been opting to reduce minimum parking requirements for additional carpool stalls, transit pass sales or contribution to the in-lieu fund. Some of the traffic mitigation programs are not working well. Problems with what to do in case of noncompliance. City does not have many options here, and it is reluctant to enforce mitigation conditions by revoking occupancy permits as this action seems very drastic to all concerned.

Case study 3: San Francisco, California.
Strategy: Informal limit on parking supply and emphasis on short-term as opposed to long-term parking. Only up to 7% of a building's gross floor area can be devoted to parking. New buildings must have an approved parking plan before receiving an occupancy permit. Developers must provide traffic mitigation plans and annual progress reports. The traffic mitigation plans are based on guidelines issued by the city. They include: a) designation of an on-site transportation coordinator, b) provision of transit and rideshare information, c) a semiannual employee survey to track proportion of solo drivers, and d) implementation of strategies such as sale of transit passes.

Experience to date: city planners are generally satisfied that parking management strategies have helped maintain good transit use and kept automobile use low (1983 downtown mode split: 60% ride transit, 16% rideshare and 17% drive alone). The policy of discouraging long-term parking in favor of short-term parking needs improvement. Planners say the developers and parking operators sidestep the main intent of this issue.

Higgins, T.J. (1985), "Flexible Parking Requirements for Office Developments: New Support for Public Parking and Ridesharing". Transportation, Vol.12. Elsevier Science Publishers, pp. 343-359.

Flexible parking requirements.
Method: Based on experiences of several cities in late 1970's and early 1980's, implications and cautions are drawn with respect to flexible parking requirements as a parking management strategy. The main issues discussed in the article are: a) whether developers take advantage of flexible requirements, b) whether agreements with developers lead to agreed-upon action, and c) whether actions lead to desired results. Imperical studies mentioned in the paper include: Calgary (Canada), Davis (California), Evanston (Illinois), Montgomery County (Maryland), Bellevue (Washington), Chicago (Illinois), Palo Alto (California), Portland (Oregon), Sacramento (California), San Francisco (California), Seattle (Washington) and Sunnyvale (California). All studies are from late 1970s and early 1980s.

Jewell, M.J. et al (1990), "Status of Traffic Mitigation Ordinances". Transportation Research Record No.1280, Transportation Research Board, pp. 1-10.

Traffic mitigation ordinances (i.e. flexible requirements).
Contents: This article reports on the current status of the use of traffic mitigation ordinances to reduce traffic congestion. Major components of traffic mitigation ordinances and issues in the development and application of ordinances are discussed. Findings are based on a review of 24 traffic mitigation ordinances, which have been adopted or are in some stage of development in 20 jurisdictions throughout the U.S.

The main points of the article:
Goals. Traffic mitigation ordinances typically set a goal that employers or developers must achieve. This goal can be expressed in a variety of forms including:
a) participation rate; it is measured as the percentage of an employer's workforce expected to commute to and from work by non-SOV mode, may be expressed as a decrease in the percentage of SOV commute trips,
b) vehicle trip reduction; it is expressed as the percentage reduction in SOV trips,
c) peak-hour vehicle trip reduction,
d) level of service (LOS); usually the idea here is to maintain present LOS on any portion of street system affected by proposed new development.

Scope. Ordinances may apply to all involved parties or only to one or two of them. The involved parties include: employers, developers, property owners, office complexes, industrial sites, retail developments and residential developments. All of above are further divided into existing and new. Most jurisdictions exclude residential developments because generally it is easier to initiate transit and ride share incentive programs at the destination rather than origin of commuter trips. Ordinance requirements typically vary by the size of the employer or developer with thresholds based on gross square feet or number of employees.

Geographic coverage. Ordinances can apply throughout a jurisdiction or to selected areas, depending on ordinance's goals. Usually jurisdiction-wide application has much greater impact on commuters' travel choices.

Requirements. Ordinances typically contain four types of requirements:
a) data collection, survey and report requirement,
b) information dissemination,
c) designation of transportation coordinator,
d) development of traffic mitigation program.
Not all four requirements need to be specified, requirements are generally more stringent for

larger employers and developers. (All four requirements are described in detail in the article).

Effectiveness. Most traffic mitigation ordinances are still in development, adoption or early implementation stages and are too new to draw conclusions regarding effectiveness. The two case studies in which this TDM policy has been implemented for a relatively long time indicate that ordinances were quite effective in achieving specified goals.

A key factor affecting the success of an ordinance is the area's stage of development. Newly developing areas may experience limited success in achieving set objectives due to lack of transit services and other amenities or low densities.

The analysis of case studies seem to indicate that although ordinances appear to be effective in cities facing new traffic congestion problems, their application in cities with long-standing problems is less clear.

Kenyon, K. (1984), "Increasing Mode Split Through Parking Management: A Suburban Success Story". Transportation Research Record No.980. Transportation Research Board, pp. 65-69.

Flexible requirements, maximum and minimum requirements.

Case study: Bellevue (Washington), 1983.

Strategy: Stricter parking zoning laws allowing only a maximum of 3 parking spaces and a minimum of 2 spaces per 1000 square feet of office space (as opposed to old requirement of at least 3.3 spaces). Developer requirements include: a) no more than 30% of the total parking stalls to be used by single occupant vehicles, b) preferential parking garage assignments to be made for carpool and vanpool vehicles, c) an inverted parking rate formula to be used as an incentive to high-occupancy vehicles (what was done was: solo drivers made to pay $3.00 per day per parking, carpools of two employers could purchase monthly parking permits for $45.00, carpools of three or more and vanpools allowed to park free). Thus, the restricted supply of parking and its high cost were to be disincentives to driving alone. At the same time, carpools and vanpools were assured of parking spaces and had further incentives such as discounted monthly rates and in-and-out privileges.

Results: Mode split: 60% of employees carpool to work, 17% use transit, only 19% driving to work alone. This mode split can not be compared to pre-parking strategies mode split since the company moved to a new site with a completely different conditions from the old one. It can only be said that the above mode split is extremely good for the type of community that Bellevue is (rather suburban). It should be noted that the existing mode split may not all be due to stricter parking requirements and ridesharing programs, many of the employees were accustomed to getting to work on bus (peak hour transit use in downtown Seattle was then 52% of the work force).

Levinson, H. (1983), "Travel Restraints in City Centers: The American Experience". Transportation Quarterly, Vol.37, No.2. Eno Foundation for Transportation, pp. 277-288.

Parking caps, maximum and minimum requirements.

General paper. This article reviews the American experience with respect to travel restraints in city centers. The concept of travel restraints that inhibit or restrict car use in the city center has become increasingly popular as a means of alleviating problems like air pollution, energy consumption and traffic congestion. The types of travel restraints discussed in detail in this article are: a) transit priority lanes, b) pedestrian and transit streets, c) stopping road construction, d) parking management (actions within this area: stabilizing downtown parking

supply; modifying zoning requirements to specify maximum, rather than minimum parking requirements; increasing all-day parking rates; applying parking taxes; instituting peak-hour parking surcharges), e) road and bridge tolls, f) auto free zone and g) traffic restraint by capacity management. The last part of the article contains implications derived from the overview of various traffic restraints and of effects of those restraints from case studies.

Only a part of this article is relevant to this topic.

Loudon, W.R. (1989), "Air Quality Offsets for Parking". Transportation Research Record No.1232. Transportation Research Board, pp. 68-75.

Restrictions in parking supply.

Case study: Portland (Oregon), 1987-1988.

This paper evaluates the effectiveness of many parking management strategies in improving air quality. The strategies considered were as following: subsidies to ridesharing and transit, parking pricing, restrictions in parking supply, fringe parking, park-and-ride lots. The success of each strategy was measured in terms of decreasing CO emissions. The following issues are covered in this paper: a) description of air quality problem in downtown Portland, b) description of method used in evaluation of transportation strategies, c) effect of each strategy on CO emissions and on number of vehicle trips heading for downtown.

Only a part of this article is relevant to this topic.

In 1975 the city set a ceiling of roughly 40,000 parking spaces in the downtown and has maintained that ceiling at least until this article was written, that is for 13 years. Concentrations of CO have declined steadily since 1975 but the recorded level in 1985 was still 10.1 mg/m3 (in 1976 the CO level was almost 15 mg/m3). It should be noted that other management policies implemented over the years have contributed to decrease in CO levels. Nevertheless, it is believed that parking cap in downtown Portland has been the major factor in that decrease.

Marchwinski, T.W. (1990), "Development and Implementation of a Downtown Parking Management Program Based on Highway Capacity - The Jersey City, New Jersey, Experience". 1990 Compendium of Technical Papers. Institute of Transportation Engineers, pp. 187-190.

Lowering maximum parking ratios at new developments.

Case study: The Jersey City (New Jersey), 1987.

Strategy: Limiting the supply of off-street parking spaces at new developments through restrictions in maximum office parking ratio.

Method: This article describes the technical process used to revise the maximum parking ratio. The factors considered in the process included: capacity of the roadway network, present and future roadway demand, present auto and transit occupancies, necessity of provision some short-term parking for visitors and deliveries.

Results: Technical evaluation established that the maximum office parking ratio which could be supported by the capacity of the downtown roadway system is 0.9 spaces per 1000 GFA (1000 square feet of gross floor area). The recommendation, which was put forward as the result of the study, was to lower the maximum office parking ratio for new development to 0.9 spaces per 1000 GFA.

McCutcheon, M. and Hamm, J. (1983), "Land Use Regulations to Promote Ridesharing: An Evaluation of the Seattle Approach". Transportation Quarterly, Vol.37, No.4. Eno Foundation for

Transportation, pp. 479-491.

Off-street parking management: developer requirements (in this case carpool incentives), restricting supply of SOV parking spaces.
Case study: Seattle (Washington), 1979-1982.
Strategy: Seattle requires each new CBD office development to establish and administer a carpool program, and to set aside parking spaces for exclusive carpool use. As well, the amount of SOV (single occupancy vehicle) parking spaces is limited.

Method: This article describes in detail the development of Seattle's strategy to promote ridesharing. It also evaluates the effectiveness of that strategy by looking at: a) the percentage reduction in long-term SOV parking supply and b) utilization of the carpool set-aside spaces in a few newly developed offices affected by the ordinances. Finally, authors offer recommendations as to how to modify the strategy in order to improve its success.

Results: Ridesharing measures have not had a great impact on work mode splits. In all instances, the carpool parking utilization rate was very low, even though the long-term parking supply for SOV's was reduced by an average of 42%. It was difficult to establish if low carpool parking utilization was due to inefficiency of parking ordinance or other reasons. No mode split for new developments was provided, and no average mode split for whole area was given either. Therefore impossible to assess the actual carpool mode usage, and decide if carpools are formed but just parking elsewhere than new developments due to high parking prices there or not being formed at all. Authors of the paper believe that the methodology used for determining the number of required carpool spaces was not correct; it led to an unrealistic estimate of the overall potential for increased ridesharing.

Not once did verified carpools and vanpools occupy more than 2% of the total number of HOV set-aside parking spaces. The reasons for this low carpool utilization are thought to be as follows:

1. Employees who formerly drove alone, and, who might have carpooled and parked at the site, have decided to use other travel modes and are now arriving to work by transit, bicycle, walking or are being dropped off. Thus overly optimistic prediction of carpool mode usage led to too many parking spaces being set apart for HOV car usage.
2. Some employees have remained solo-drivers but changed parking locations. They are parking at nearby, less costly locations. Parking charges for carpool and solo-driver vehicles in the office buildings under consideration are at the top of scale for CBD, in some cases the differences in parking prices are 8 to 1.
3. It is possible that the original estimate of long-term parking demand (and thus, of number of carpool spaces necessary) was too high.
4. Another possible reason is that the carpool parking set-aside is not being administered properly. One building offers carpool parking for the price eight times higher than the neighboring public carpool parking. The long term parking supply is not being restricted (as was the intention) because building managers intentionally or unintentionally are not complying with the requirements. For example, in one of the projects all parking spaces that were supposed to be carpool spaces have been converted entirely to short-term parking.

Olsson, M.L. and Miller, G.K. (1980), "Impact on Commuters of a Residential Parking-Permit Program in Alexandria, Virginia". Transportation Research Record No.786. Transportation Research

Board, pp.9-12.

On-street parking management: residential parking permit program.

Case study: Alexandria (Virginia), 1979.

Strategy: Introduction of residential parking permit program in order to restrict long-term on-street supply of parking for commuters.

Method: This article provides explanation as to why there was a need for on-street parking management. It gives detailed description of the strategy and its implementation, and evaluates its effects after a year in operation.

Results: The mode split has changed somewhat after implementation of new regulations. The impact is not too significant due to the abundance of free parking either off-street or right outside affected district. The effects of the parking permit program on modal split neutralized somewhat by the actions of employers who began to provide parking subsidies after new regulations were implemented. Most of the commuters continued to drive alone. 50% of them just changed parking location to off-street parking or on-street places outside the affected area, another 20% continued to park on-street in the affected zone but did not stay in the same space longer than was legally allowed (3hrs). Only 12% of commuters changed transport modes from single-occupant automobiles to either transit or carpools.

Pickrell, D.H. and Shoup, D.C. (1980), "Land Use Zoning as a Transportation Regulation". Transportation Research Record No.786. Transportation Research Board, pp.12-17.

Criticism of using minimum off-street parking requirements.

General paper. The authors try to show potential hazards of remedying urban transportation problems indirectly by intervention in the land market through stipulation of minimum parking requirements, rather than by direct intervention in the transportation market itself. This paper discusses the effects of requirement to provide a minimum amount of off-street parking space. Evidence is demonstrated that the above causes the overall parking to be well above what the land market would supply in the absence of such requirements. The result is a depressed market price of parking to a level below the cost of its supply, which in turn leads to an increase in the number of trips made by automobile. Parking requirements may also cause distortions in the urban land market. They can impose a "tax" on new development, which not only slows the redevelopment of older areas but may also alter the spatial pattern of new development in undesirable ways.

This article covers the following issues: a) rationale for reliance on zoning for regulation of urban transportation market, b) consequences of minimum parking requirements. It provides examples as to how much parking space is required in various California cities.

Public Technology, Inc. (1982), The Coordination of Parking with Public Transportation and Ridesharing. Report #DOT-I-82-29. U.S. Department of Transportation.

General paper. This article discusses the following topics: 1) parking incentives to increase ridesharing (preferential parking for HOVs, differential parking rates based upon vehicle occupancy), and 2) parking incentives to increase the use of public transit (fringe parking, off-site substitute parking, flexible transportation subsidies). This article also lists parking management programs undertaken up to 1982 in many cities in United States.

Only a part of this article is relevant to this topic.

Shoup, D.C. and Pickrell, D.H. (1978), "Problems with Parking Requirements in Zoning Ordinances". Traffic Quarterly, Vol. 32, No. 4, pp. 545-561.

Criticism of using minimum off-street parking requirements.

General paper. This paper criticizes the process of using zoning requirements (and especially minimum requirements for parking) to solve problems like air pollution or traffic congestion, which are only indirectly related to the land market. The paper starts by listing several faults and shortcomings in such a process. Next are reasons as to why, despite the flaws, the above process is so widespread. The following section of the article describes how and when minimum and maximum parking requirements are used. The rationale for using minimum requirements is given as: a) to reduce traffic congestion - more off-street parking can help get automobiles off the streets once they are at their destination, b) to reduce the "cruising" - the provision of more off-street parking would reduce its price, thus decreasing the time of finding "adequately low priced" parking spot, c) to reduce parking spillover, and d) to encourage downtown growth. To summarize, the reasons for using minimum parking requirements are based on issues of traffic and parking in the immediate vicinity of a new building. On the other hand, the rationale for using maximum requirements for parking is based on issues of congestion on routes leading to activity centers and the need to reduce it. Less off-street parking is believed to reduce the number of automobiles travelling to activity centers. The next part of the article deals with the consequences of using minimum parking requirements. These consequences are listed as: a) the total supply of parking will increase, and b) the spatial distribution of parking will be determined mainly by the location of new construction rather than by demand and cost considerations. The next part of the article compares the spatial distribution of parking supply with minimum requirements with the distribution without minimum requirements. Impacts of increased total supply of parking on parking use, choice of travel mode and traffic congestion are discussed in the last section.

Conclusions: Unwisely used, zoning may actually aggravate some of the problems it is intended to alleviate. Increased number of trips (resulting from these minimum requirements) would probably aggravate street circulation problems in the downtown area and cause additional congestion on transportation routes serving the city centre. In addition, air pollution and energy consumption may be aggravated. Parking requirements may also cause serious problems in the land market; one of them being the creation of a disincentive to inner-city redevelopment and high-density development. Another land market effect of parking requirements may be to alter the spatial pattern of new development. The attempt by developers to minimize the parking deficit (caused by falling parking prices) would tend to shift new development away from areas best served by mass transit and toward areas where automobile use (and thus the demand for parking) is highest.

Stewart, G. (1982), "The Development of Revised Parking Policies in the Central Area of the City of Toronto". The Proceedings of the 1982 National Conference of the Canadian Institute of Planners, pp. 216-223.

Off-street parking management: minimum and maximum requirements, flexible requirements.

Case study: Toronto (Ontario), 1980.

Strategy: Changing parking policies for the central area in order to introduce stricter controls on the supply of commuter parking.

Method: This paper discusses the revision process of parking strategy for commercial land uses

in the CBD area. It presents both the originally proposed strategy as well as strategy finally approved. The issues discussed in the proposed approach included: a) minimum and maximum requirements for new developments, b) limiting parking supply if multiple or joint usage, c) the abolition of the parking exempt zone, d) the prohibition of parking as principal use, and e) payment-in-lieu process. The description of each strategy was quite general. The article did not specify to what degree each strategy is going to affect the modal split.

Results: The major points of the accepted parking approach were: a) introduction of maximum parking ratio for new developments, b) reduction in minimum parking requirements from 1 space/93 to 1 space/300 square meters of net floor area, c) limiting parking facilities by requiring sharing of parking space if new development was multiple or joint usage.

Van der Hee, B. et al (1984), "Effects of Parking Measures in the Center of Leeuwarden". Transportation Research Record No.957. Transportation Research Board, pp.71-76.

On-street parking management: residential parking permit program.

Case study: Leeuwarden (Netherlands), 1979.

Strategy: Introduction of residential parking permit program in order to restrict long-term on-street supply of parking for commuters. Other initiatives include: increases in parking fees, the conversion of free parking spaces into paid parking spaces and the opening of the new underground car park.

Method: This article provides an explanation as to why there was a need for on-street parking management. It gives a detailed description of the strategy and its implementation, and evaluates its effects after a year in operation.

Results: Overall, parking density in the affected area has decreased significantly (on average 30%). The greatest drop was due to a decrease in commuter trips, although a significant drop in shopping trips has occurred as well. The mode split has changed somewhat after implementation of new regulations. The impact is not too significant due to abundance of free parking either off-street or right outside affected district. The majority of the commuters continued to drive alone, some of them (25%) switched location of parking to the fringe of the central district or to employer parking lots and underground parking (another 25%). A high proportion (about 20%) of illegal parking was observed. It was unknown what percentage switched from private cars to public transport or cycling or walking.

APPENDIX B - PARKING PRICING LITERATURE

Bevan, T.A. (1991), "Parking Pricing as a Demand Management Strategy". 1991 Compendium of Technical Papers. Institute of Transportation Engineers, pp. 267-271.

Transit and carpool allowances, parking pricing.

Case study: Bellevue (Washington), 1987-1990.

Strategy: Introduction of parking fees ($40.00), transportation allowance of $40.00, carpool subsidy of $15.00 per person, transit subsidy of $15.

Method: This article describes the development of the transportation management program used by CH2M Hill engineering consulting firm. As well, it evaluates the program throughout its four years of operation. Finally, the author provides reasons for the program's high effectiveness and suggests possible improvements.

Results: A significant change in the modal split has been observed. Single auto-drive mode has decreased from 89% to 52%. The transit usage has increased from 12% in 1987 to 20% in 1990. The average carpool mode split has been 10% during the time period under consideration, ridesharing seemed to have been more popular in the late 1980s, in the early 1990s carpool usage has fallen slightly. As seen from the above results, the transportation program implemented by CH2M Hill company has been very successful. That is primarily due to well-chosen package of incentives - employers have found it financially worthwhile to switch travel modes. As well, during development of the program, employees were consulted with respect to possible strategies, which also contributed to the program's success.

Kunze, B. et al (1980), "Impacts of Municipal Parking-Fee Increases in Downtown Chicago". Transportation Research Record No.786. Transportation Research Board, pp. 21-30.

Impacts of parking fee increases on travel patterns and parking demand.

Case study: Chicago, Illinois (1978).

Strategy: Substantial fee increase at eight downtown city-owned parking facilities. (Parking fees made equal to those of surrounding private parking lots)

Results: Long-term parking decreased by about 50% and by 72% for vehicles arriving before 9:30 on weekdays. Since increased use was not evident at neighboring private parking facilities, it was decided that many of the former all-day parkers are using transit. Thus, the increased parking fees induced significant changes in travel patterns, especially work oriented trips by car. Another result of higher fees was increased popularity of short-term parking (less than three hours). These changes were small, only about 2%, caused by the greater availability of space. The results given above are averages of individual results from each of eight facilities.

Mackey, P. (1991), A Tax on Parking: Justification and Impacts. Quebec Ministry of Transport.

Parking taxes.

Contents: The article starts by listing reasons for implementing parking taxes. Next several forms of parking taxes proposed in Quebec are described. Then, different taxes are compared to each other on the basis of advantages and disadvantages.

The main points of the article:

Reasons for implementing parking taxes: 1) to provide a revenue source for the government, 2) to reduce the automobile usage and enhance transit and car pooling, 3) to correct an injustice

created elsewhere in the fiscal system. (This injustice being that the employee to whom the employer provides free parking does not declare the cost of the parking benefit as a taxable benefit, whereas the employee who gets transit allowance needs to declare it as a taxable benefit.) 4) to tax in relation to the indirect benefits received. It is believed that the existence of a public transit system reduces urban congestion considerably. This results in a time and money savings for the motorists. Also, businesses benefit significantly from urban transit as it facilitates travel to work by their employees. Municipalities should therefore tax motorists and businesses for these indirect benefits received from urban transit. 5) to tax in relation to the direct benefits received.

Proposed forms of parking taxes: 1) Initial Ryan Proposals - local elected representatives decide on the levels of municipal services to be provided and the taxes necessary to support them. Thus, each municipality has the power to set the parking tax at what it considers to be the appropriate level and according to its own criteria. The criteria include the number of nonresidential parking spaces, and the area and value of the land. The major weakness of this option is that it does not link directly to the motorist. 2) Powers of the City of Montreal. This charter allows the tax rate to vary according to location and to categories established by the council. The municipality has additional flexibility of defining categories of non residential parking according to their size or number of parking spaces, whether at grade or multi level, and whether parking is free or not. 3) Other Formulae - a tax on monthly parking passes or a tax at certain hours of the day only (peak hour periods).

Conclusions: A parking tax linked directly to the motorist is both an equitable mean to tax roadway usage and an important incentive to the use of alternate modes to the automobile. But both the Powers of the City of Montreal and the Ryan proposals seem to have been prepared with haste and contain major flaws. The Ministry of Municipal affairs should give a wide choice of autonomous actions to municipalities with respect to the taxation of parking in order that they can adopt the format most suitable to their needs. Before imposing a tax on parking, municipalities should define with care both the objectives of the tax and the type of tax to use.

Miller, G.K. and Everett, C.T. (1982), "Raising Commuter Parking Prices - An Empirical Study". Transportation, Vol.11, No.2. Elsevier Scientific Publishing Company, pp. 105-129.

Effects of parking price increases on commuting behaviour.

Case study: Washington, D.C. (1979).

Strategy: Parking rates for employees at 15 federal facilities were introduced or increased substantially. These rates were made to be one-half of nearby commercial parking rates.

Method: Modal shifts, automobile occupancy and parking behaviour were monitored. Impacts were evaluated twofold, by doing a before and after study of facilities where changes in parking prices occurred, and by doing a comparison study between control and affected groups. The control group included several federal and private worksites in the vicinity of affected facilities but where parking charges have not changed.

Results: Removing free parking or raising parking rates created some changes, but they were not uniform in direction or magnitude across the sites. Each worksite was affected differently. Nevertheless, some trends were observed. The parking price increases had the greatest effect at central area locations with good transit accessibility. Usually, for both central and suburban locations, affected sites showed a more pronounced decrease in the proportion of solo driving trips than the control sites. In central zones, affected worksites exhibited a slight increase (about

5%) in the transit usage whereas no change or slight decreases were observed for control sites. In suburban zones the transit split remained unchanged for both types of worksites. In central areas, carpooling has fallen somewhat in affected sites, while in control sites it increased slightly. The amount of auto usage has decreased in affected sites: 1 to 10% reduction was observed in downtown areas and 2 to 4% in suburbs. It was observed that availability of nearby, free on street parking resulted in commuters just changing parking locations and not their mode of transport.

Conclusions: The authors concluded that the modal shifts at various worksites were not uniform in magnitude or direction due to: a) location characteristics (such as alternative parking options, transit accessibility and magnitude of the parking price), b) travel characteristics of the workforce (such as base level carpool shares and trip distances), c) socio-economic characteristics of the workforce (such as income, sex and age), d) employer controlled aspects (such as workforce size and number of parking spaces).

Miller, G. and Higgins, T. (1983), Implementing Parking Pricing Strategies. Report #3161-1. The Urban Institute, Washington, D.C.

Parking pricing and parking taxes. Strategies: parking revenue tax, parking space tax, surcharges, parking permits, raise of long-term rates, reduction of rates for certain parkers and indirect raise of rates through decreased supply.

Contents: The first section of this article discusses the reasons why parking pricing should be considered. In the second section, primary variables in a parking pricing option are listed and described (these included areal coverage, temporal coverage, level of charge, type of facility). Also in the second section, general advantages and disadvantages of the major pricing options are compared to each other. The pricing strategies discussed in the article were: parking revenue tax, parking space tax, surcharges, parking permits, raise of long-term rates, reduction of rates for certain parkers and indirect raise of rates through decreased supply. In the third section, recent U.S. experience with respect to actual parking pricing changes is reviewed. Several case studies were discussed. The summaries included the objectives and implementation concerns, the general characteristics of the area, and the before and after parking prices. It then presents the observed travel and parking impacts. The case studies contained in this report include:

a) imposition of a 25% tax on off-street parking in San Francisco, 1970,
b) raising and restructuring rates for off-street parking in City of Chicago facilities, 1978,
c) introduction of a commuter parking surcharge at three downtown facilities in Madison (Wisconsin), 1981,
d) raising monthly off-street parking rates and providing ridesharing incentives in Eugene (Oregon), 1980,
e) raising parking prices for federal workers in central and suburban Washington, D.C., 1980,
f) removing free parking for government workers in central Ottawa, 1975,
g) imposing parking pricing on new employers and providing free parking for poolers at a private company in Bellevue (Washington), 1982,
h) parking price reductions for carpoolers in Seattle in 1974, and in San Francisco in 1980, and
i) pricing non-resident parking in beachfront neighborhoods of Santa Cruz County (California), 1981.

The final section of the paper presents guidance on how to plan, analyze and implement particular parking pricing actions. With respect to planning, two steps were listed: 1) knowing current parking conditions - information should be reviewed about the parking supply, the

current parking use, alternative travel options and travel characteristics (modes used, purposes, final destinations and socioeconomic traits), and 2) selecting a parking pricing option - decisions must be made about the following features: areal coverage, temporal dimensions, level of price changes, type of affected facilities (all vs. only specific ones), administration and enforcement. With respect to analysis of pricing options both facility-based analysis and mode shift analysis were briefly described. With respect to implementation of pricing strategies the following issues were discussed: a) getting clearance from decisonmakers to proceed with a pricing action, b) administration and procedures needed to put the project into action, c) the politics of implementation, and d) procedural concerns once parking pricing action is approved.

Conclusions: Local planners contemplating parking pricing approaches should inventory and assess the existing conditions at specific locations before deciding which pricing option could be most effective. Numerous factors such as population and employment densities, business and retail concentrations, public transportation availability and the amount of ridesharing, type of employment, and the efficiency of the street network influence whether, why, how long, and where people park. In addition, the types of public taxation or feasible rate changes, will depend on ownership, type of users, and current level of user payment.

Transport Canada (1978), The Effects of the Imposition of Parking Charges on Urban Travel in Canada. Summary Report #TP-291. Transport Canada, Ottawa.

Effects of elimination of free parking.

Case study: Ottawa (Ontario), 1975.

Strategy: New policy was implemented which discontinued the provision of free parking to federal civil servants employed where adequate public transportation systems were operating. The parking rate was set at 70% of the average monthly commercial parking rate.

Method: This article reports the results of the before and after survey. The survey was designed to evaluate the performance of parking charges as a means of restraining traffic and modifying the modal split.

Results: The conclusion was that introduction of parking charges affected quite significantly the modal split and decreased the number of auto-work trips. There was a 20% decrease in single occupant auto use and a 16% increase in bus use. The carpool mode was up by 3%. Car occupancy has increased from 1.31 to 1.41 passengers/car. (All above numbers are averages of results from individual worksites).

Ulberg, C. (1990), "Parking Tax Discussion Paper". Proceedings of the Commuter Parking Symposium, Dec. 1990. U.S. Department of Transportation.

Parking surcharges: ad valorem, hourly fee, fixed fee.

General paper. This article considers the use of a parking tax as a transportation demand management tool. It describes several parking tax options (ad valorem, hourly rates, fixed fee), and estimates the effects of each option. An emphasis is placed on the role of each tax alternative with respect to influencing commuters against choosing car as a travel mode. Predictions as to how parking demand and supply are going to change, and who will be most affected (employers, employees or parking lot operators) are also mentioned.

The article describes the different types of parking, since that influences the ability to impose a tax and the requirements to audit and enforce payment of the tax. It briefly discusses the issue of taxing leased parking. As well, it mentions where parking taxes have already been implemented and what type of taxing had been used. Detailed descriptions of case studies are not provided.

APPENDIX C - TRAVEL ALLOWANCES LITERATURE

K.T. Analytics (1992), Transportation Allowances. TDM Status Report, August 1992. U.S. Department of Transportation.

General travel allowances, differential carpool allowances tied to occupancy levels, non-SOV mode subsidies in terms of vouchers.

Contents: The focus of this report is on travel allowance programs that go beyond traditional transit and parking subsidy programs. Examples of where and how these program have been used are provided. Discussed topics include the magnitude of the impacts of each type of program, implementation issues (rationales for setting up the program, eligibility requirements, monitoring procedures and administration, reactions of managers and employees, tax consequences, and cost implications), and future directions for the programs.

Programs under discussion: 1) transit and vanpool fare subsidies in terms of vouchers purchased by employers and given to their employees, 2) carpool fare allowances where the amount of subsidy is tied to the vehicle occupancy, 3) differential allowances for transit ridesharing and parking - these are transportation allowances that provide financial incentives to all modes except solo-driving, they increase with an increase in vehicle occupancy, 4) general travel allowances - these can be used by the employees toward any mode they choose or for any non-transportation purposes (including salary boost substitutes for parking or transit subsidies).

Conclusions: It is suggested to link travel allowance programs with implementation of parking charges (at least for solo drivers) in order to better enhance trip reductions and to generate revenues to partially off-set the allowance expenses. Another suggestion is to combine two or more travel allowance programs, since individually they have only a modest impact on modal shares.

Pickrell, D.H. (1990), "Federal Tax Policy and Employer-Subsidized Parking". Proceedings of the Commuter Parking Symposium, Dec.1990. U.S. Department of Transportation.

Cash-out option, space tax, excise tax, taxation of employer-paid parking, increased tax exemption on transit and carpool subsidies.

General paper. This article explores the issue of offsetting the solo-driving effects created by employer-subsidized parking. It suggests several ways of dealing with above problem and describes them all including advantages and disadvantages of each. The discussed proposals are: 1) reclassification of employer-provided parking as a taxable fringe benefit, 2) permission to let employers classify some amount of each employee's gross earnings as a tax-exempt "travel allowance", subject to the condition that the employer did not also offer free parking, 3) imposing on employers a federal excise tax on the value of free parking they provide, 4) levying a uniform per-space federal tax on owners or operators of parking facilities, and 5) increase in the current tax exemption of employer-provided transit passes and vanpool benefits.

In addition, the paper briefly discusses the effects of providing free parking at worksites. That is substantiated by citing results of several case studies. Also, an explanation as to why the employer-subsidized parking is so widespread is given.

Riklin, E. S. et al (1994), "The Projected Effect of Parking Policies on Transit Ridership in the Hartford, Connecticut Region". Preprint presented at the 73rd Annual Meeting of the Transportation Research Board, Washington, D.C.

Comparison of effects of various travel allowances and parking subsidies on mode rates.

Contents: This article describes the process through which the Hartford TMO Downtown Transportation Committee identified the optimal long range parking/transit policy to be implemented over a ten year period by the major Hartford CBD employers.

Method: The process consisted of the following steps:
a) identification of current Hartford Downtown employer parking policies,
b) identification of current work trip mode choice of CBD employees,
c) generation of six alternative long range parking/transit policies for analysis by CRCOG,
d) projection of impacts of each of six alternative policies upon the work trip mode choice of employees,
e) comparison of the changes in mode choices due to changes in parking policies predicted by the CRCOG model with changes in mode choices predicted in other studies,
f) selection of the optimal parking policy based on long range transportation goals.

Alternatives: The transportation demand management policies identified by the Committee for analysis included:
a) employer parking subsidy at 50% of market value of parking price, no transit subsidy, b) employer parking subsidy at 25%, no transit subsidy,
c) employer parking subsidy at 0%, no transit subsidy,
d) employer parking subsidy unchanged (i.e. employer subsidy at 55%), $21 transit subsidy,
e) employer parking subsidy at 0%, $21 per month transportation allowance,
f) employer parking subsidy at 0%, $60 per month transportation allowance.

Results: In order to project the implications of each of the six demand management strategies, the mode choice model with each option's characteristics was executed for the year 2010. The results obtained are summarized in the following table.

Scenario	employees' share of parking fee	transit subsidy	modal split transit	ride-share	SOV	
do nothing	45%	0%	28%		28%	44%
a	50%	0%	30%		30%	40%
b	75%	0%	40%		33%	27%
c	100%	0%	49%		34%	17%
d	45%	40%	32%		27%	41%
e	75%	40%	44%		30%	26%
f	50%	100%	37%		27%	36%

The analysis suggested that the elimination of parking subsidies (alternatives b and c) would have a more significant impact upon transit usage than would the provision of a transit subsidy (alternative d). The analysis also indicates that the elimination of parking subsidies (alternatives b and c) would have a more significant impact upon transit usage than would the provision of either a $21 per month or $60 per month transportation allowance (alternatives e and f). An interesting observation occurs when impacts of alternative e are compared to these from alternative f. The $21 per month transportation allowance is projected to have a more significant impact upon workers mode choice because the worker would have to pay a higher percentage of

a parking fee with a $21 allowance than with a $60 allowance.

Conclusions: The Committee determined that the most effective and most probable long range parking/transit policy to be implemented will be market price parking in combination with a transit subsidy of $60 per month. The implementation of this policy is projected to increase work transit trips to the area from 25% to 57% per day, reducing peak hour vehicles by 39%. Most of this increase (49% out of 57%) in transit usage is believed to be due to the elimination of the parking subsidy.

Shoup. D.C. (1992), Cashing Out Employer-Paid Parking. Report #FTA-CA-11-0035-92-1. U.S. Department of Transportation.

Cash-out option, critique of employer-paid parking.

General paper. This study explores the problems created by employer-paid parking, proposes a solution to these problems, and predicts the consequences of the proposal.

Strategy: The proposal changed the Internal Revenue Code to specify that employers who subsidize employee parking should be required to offer employees the option to take a taxable cash travel allowance equal to the fair market value of the parking subsidy.

Method: First, the author describes how employer-paid parking stimulates solo driving to work, and how that, in turn, increases traffic congestion, air pollution and energy consumption. He cites the results of several case studies in order to prove the above. Then, he suggests a solution, and provides a detailed description of it together with listing its advantages. The paper answers questions about how it should be implemented, why it would work better than other similar proposals, and who will benefit from it. The next, estimation of savings for Los Angeles CBD is done, which is followed by predictions of national savings. Last, the author describes briefly cases where cash-out options have already been implemented or are in the process of implementation (one case being California Cash-Out Legislation).

Results: Predictions: solo driving will drop by about 20 percent, automobile travel to work will reduce by 76 billion miles per year, 4.5 billion gallons of gasoline will be saved per year, 40 million metric tons of CO2 emissions will be eliminated per year, tax revenues will increase by $1.2 billion per year. These are national predictions, they were obtained by extrapolation of estimated savings in Los Angeles CBD.

Shoup, D.C. and Willson, R.W. (1990), "Employer-Paid Parking: The Influence of Parking Prices on Travel Demand". Proceedings of the Commuter Parking Symposium, Dec.1990. U.S. Department of Transportation.

Cash-out option, critique of employer-paid parking.

Contents: The paper starts by summarizing results of previous case studies of the influence of employer parking subsidies on commuters' travel choices. The next, it reports on a new multinominal logic analysis of subsidized parking in downtown Los Angeles. Then, based on above data, the paper extrapolates upon the policy of employer-paid parking and discusses in detail its negative effects. Next chapter of the article suggests a way to reverse these effects. The proposal consists of requiring any employer who provides a parking subsidy to offer the option of the market value of the parking subsidy as a cash travel allowance instead of the parking spot. The article describes the proposal in detail and estimates its merits. To strengthen the case for this suggested policy, the paper concludes by briefly describing three other possible approaches to reducing effects of employer-paid parking. Comparison of these to the suggested alternative shows that the latter is far superior. These other approaches are: 1) elimination of the income tax exemption for employer-paid parking subsidies, 2) increase of the income tax exemption for ridesharing benefits, and 3) a tax-exempt commute allowance in lieu of employer-

paid parking.

Results: 1) Previous case studies (Mid Wiltshire, Warner Center, Century City and Civic Center (all from vicinity of Los Angeles) and Ottawa, Canada). Subsidized parking increases solo driving by on average 41% and increases the number of auto trips by an average of 27%. 2) New logic model (based on downtown Los Angeles). The model estimated that the employer-paid parking causes a 20% increase in the number of cars driven to work. It predicted that solo driving will fall by 13% if parking subsidies were eliminated. In addition, the model showed that commuters are sensitive to the after-subsidy price of parking. As the after-subsidy price of parking increases, parking demand and automobile trip generation significantly decline.

Willson, R.W. and Shoup, D.C. (1990), "Parking Subsidies and Travel Choices: Assessing the Evidence". Transportation, Vol.17, No.2. Kluwer Academic Publishers, pp. 141-158.

Employer-subsidized parking.

This article summarizes the results of several case studies on the influence of subsidized parking on employees' travel choices. Three measures were used here to evaluate effects in commute patterns: 1) changes in the share of solo drivers, 2) changes in the number of autos driven to work per 100 employees, and 3) parking price elasticity of demand. The studies reviewed in these articles were mostly from the vicinity of Los Angeles, the remaining two were from Washington, D.C. and Ottawa, Ontario. The earliest study was from 1969, the latest from 1987.

Results: Each study observed a strong correlation between parking subsidies and solo driving. With the decrease or removal of subsidies, a number of solo drivers always shifted to carpools or to transit.

Willson, R.W. and Shoup, D.C. (1990), The Effects of Employer-Paid Parking in Downtown Los Angeles: A Study of Office Workers and Their Employers. Southern California Association of Governments, Los Angeles.

Employer-paid parking.

Case study, Los Angeles (California), 1986.

Contents: This report presents evidence that employers' parking policies are an important influence on travel behaviour. With downtown Los Angeles as a study area, this report provides: 1) the effect of parking subsidy policy on commuter mode choice, 2) employers' expenditures on parking subsidies, 3) the distribution of parking subsidies among employees of different income and gender groups, 4) the motivations of employers in subsidizing parking, and 5) policy recommendations.

Method: The analysis is based on comparing mode choice differences between employees whose parking is paid for and those who have to pay for it themselves.

The main points of the article:

The effect of parking subsidies on mode choice:

Employer-paid parking constitutes a significant encouragement for commuters to drive alone. When mode choice comparison was made between the two groups of employees, 24% fewer of those who had to pay for their own parking chose to be solo drivers. When mode choice in terms of the "number of cars driven to work per 100 employees" was checked the results also indicated influence of parking subsidies. 76 cars were counted among those who park free versus only 58 counted among those who pay to park.

Employers' expenditures on parking subsidies:

It was estimated that in 1986 employers spent between $56 and $74 million per year on

employee parking subsidies. That subsidy level translates to a 1986 average employer expenditure of between $851 and $1027 per subsidized driver per year.

The distribution of subsidies among employees of various income and gender groups:
The percentage of employees receiving subsidies was found to be fairly similar among income and gender categories. The average level was 55%. None of the employer or employee characteristics had a strong relationship with the proportion of employees receiving subsidies.
The average subsidy per subsidized driver does vary with one employee characteristic. The dollar amount of parking subsidization increases with income.

The main justification for parking subsidization was that it was considered a longstanding employee fringe benefit. Another important reason was that because parking subsidies are not taxable and most other possible travel benefits are, employers opt for parking subsidies. Thus the present taxation law is such that it encourages employer subsidized parking.

Parking policy recommendations:
The main recommendation was to offer the "commute allowance option". (The same thing as "cash-out option" described in several other articles). Short description of this option together with its possible benefits are presented in the article.

Other recommendations:
- to focus on local parking requirements. The sensitivity of mode choice to parking price has implications for the amount of parking that local ordinances require of developers.
- to change current tax policies concerning the tax free status of parking subsidies, and taxable status of rideshare incentives or commute allowances. The explicit tax bias in favor of employer-paid parking is inappropriate and potentially harmful.

Willson, R.W., Shoup, D.C. and Wachs, M. (1989), Parking Subsidies and Commuter Mode Choice: Assessing the Evidence. Southern California Association of Governments.

Employer-subsidized parking.

Contents: This report assembles and summarizes existing studies about the relationship between parking subsidies and the proportion of commuters who drive to work alone. The article also lists and describes circumstances which affect the amount of solo driving. In addition, the article briefly comments on employers' attitudes toward parking subsidies and the political and administrative aspects of parking subsidies.

Strategy: Most studies under consideration either examine mode split before and after employer parking subsidies were changed, or among a matched sample of employers with and without parking subsidies.

Method: In this article three measures are used to compare changes in commute patterns: 1) changes in the proportion of solo driving, 2) changes in average vehicle occupancy (a positive percentage change reflects greater number of persons per vehicle under conditions of higher parking costs), and 3) the price elasticity of demand for solo driving (the expectation here is to find negative elasticities, these would mean that solo commuting decreases as parking price increases).

Results: A strong relationship between parking subsidies and solo driving exists, i.e. employer paid parking greatly increases the number of employees who drive to work alone. The case

studies covered a wide variety of locations, employers and employees, and all confirmed this influence of parking subsidies on mode choice.
Results from three measures of comparing changes in commute patterns: Removing or reducing parking subsidies had a dramatic effect on mode splits - solo driving decreased considerably (from 18% to 83% in cases analyzed in the article), while transit usage and carpooling increased. The average vehicle occupancy rate was found to increase between 17 and 76% when employers stopped to subsidize parking. In the cases considered, the estimates of the price elasticity of demand for solo driving was ranging between -0.10 and -0.71, meaning that as the price of parking is doubled, solo driving is likely to decrease by between 10 and 71%.

Circumstances which affect the amount of solo driving:
1) Employer-paid parking is worth more to most commuters than an offer of free gasoline. When parking subsidies are eliminated or replaced with a commute allowance, the economic effect spurs most types of employees (not just low paid workers) to seek alternatives to solo driving.
2) Well developed transit facilities provide an attractive option for commuters who face market parking prices. However, they are not a prerequisite to successfully decreasing solo driving. Strong examples of the effect of reducing parking subsidies were found in suburban locations having poor transit service.
3) Employers who reduce parking subsidies do not prevent those who want to or must drive alone from doing so. This needs to be taken into account when projections are made about possible effects of parking policies.
4) The employers' efforts to reduce parking subsidies should be coordinated with parking requirements in zoning ordinances, so that reduced parking demand is balanced with parking supply.

APPENDIX D – PERTINENT REFERENCES IDENTIFIED SINCE THE INITIAL PUBLICATION OF THIS STUDY

Prepared May 1999

This report was initially completed in 1995. The intent was to follow it up with a subsequent study of actual North American experience with developing and implementing transit-supportive parking policies, that might serve to identify the most effective model policies that municipalities might pursue. In anticipation of this follow-up study, a number of other pertinent references were identified, and in some cases reviewed. Rather than revise the entire report, a new Appendix D has been compiled that incorporates the reviews prepared and lists these more recent references.

This Appendix contains the following sections:

A] Parking Pricing Choices and Impacts (1994), a transcript from a TRB Session
B] Calgary GoPlan (1993-1995)
C] Rationale for a Downtown Auto Commuter Parking Policy (1996)
D] Strategies To Attract Auto Users To Public Transportation (1998)
E] Other Recent Refernces

A] Parking Pricing Choices and Impacts (1994)

Transportation Research Board Annual Meeting, 1994
Based on audio transcript of of Session #237

1. Presentation #1
J. Hirten, "How Parking Charges Influence Commute Decisions".

The commuter's decision as to which mode to choose is neither a simple nor rational process, it consists of the weighting of a mixture of real and perceived advantages and disadvantages with respect to each feasible mode. How unpredictable this process is can be observed from the fact that both solo drivers and carpoolers use the same arguments as to why they choose their respective modes: 1) convenience and flexibility, 2) travel time, 3) cost and 4) parking. Most commuters do not know the real cost of the trip; when evaluating options they consider only daily out-of-pocket expenses.

Free or subsidized parking skews the mode preference towards solo driving. Results of several case studies support that statement. For those who have available to them free or subsidized parking, 72% drive to work, but for those that have to pay for parking, only 37% drive alone. The employer-subsidized parking has a value of $1000.00 per year for the employee. Further, it was estimated that the imposition of a $8.00 daily parking fee would decrease the demand for parking spaces from 2.5 to 1.75 spaces per 1000 square feet. In addition, approximately 20% would switch from SOVs into another travel mode if they were required to pay the market rate

for parking. (The above numbers are estimations for the San Francisco area only).

The next part of the presentation involved an explanation as to why employers subsidize parking. The major reason given was that the value of parking is exempted from taxation if employer pays for it, but not if the employee does so. Another reason was that a $100 parking has a value of $100 to the employee, whereas $100 transit subsidy has a value of only $74 to the employee; therefore employer-subsidized parking is a more widespread solution. Yet, another reason why employers provide free parking is because it is widely considered as a "have to be present" work fringe benefit. No employers want to create a competitive disadvantage for themselves when hiring employees.

In the last part of the presentation possible solutions to the parking problem were listed. These were as following:

1. Amendment of the federal tax code to reclassify parking as a taxable fringe benefit; in this way the primary motivation for employers to provide free parking would be eliminated.
2. Classification of some gross earnings of each employee as tax-exempted travel allowance, subject to the condition that the employer did not also offer free parking.
3. Equal monetary provisions and tax exempt assistance to both solo drivers as well as transit riders/carpoolers. At the present time these provisions are not of equal value, transit riders or carpoolers are eligible for only $60 per month travel allowance whereas solodrivers often enjoy much higher in value parking privileges.
4. Introduction of a parking tax on all uses of parking facilities (whether private or public); the proceeds would be used for transportation programs.

Conclusions:
There is a need to implement such parking policies in order to eliminate preferential treatment to the drive alone mode of travel. The best solution is a comprehensive parking program, containing both incentives and disincentives. Only a suitable mixture of both will achieve reasonable mode splits. The time has come to deal with parking as a major policy component of commuter transportation.

2. Presentation #2
W. Lopez-Aqueres and C. Wasikowski, "Trip Reduction Ordinance Parking Trends".

This presentation was about the trip reduction ordinance implemented in Southern California. The first part of the presentation deals with what the ordinance is, and how it works. The second half of the presentation is concerned with what type of changes have occurred since the ordinance was implemented. Four findings are discussed; these findings are based on a survey of 5400 employer sites in Los Angeles area.

The ordinance, commonly known as Rule 15-01, was adopted in 1987 in order to decrease the number of work trips and improve air quality. It requires that every employer with 100 or more employees must introduce a trip reduction plan, and must report every year the results. Target

AVRs have been set by the South Coast Air Quality Management District. They vary with location of worksites. In downtown locations the employers should strive to obtain AVR of 1.75, whereas the goal numbers for high density suburban areas and low density suburban areas have been set at 1.5 and 1.3 respectively. Employers are not penalized if target AVRs are not met.

The findings from the employer's survey were as follows:

1. Employer-paid parking continues to be common - more than 90% of employers still provide free parking. But it was observed that the amount of employer-paid parking has been slowly diminishing. Since the implementation of the ordinance, that amount has decreased by 5% from 96% to 91%.
2. Solo driving is expected to decrease by as much as 20%, due to soon to be implemented California "cash out" legislation, which requires employers to provide the option of taking cash allowance instead of a parking space. As a consequence of decreased solo-driving, the AVR numbers are expected to raise.
3. It was observed that solo-driving is less common with large employers (the ones with more than 1000 employees at a site). As well, employer-paid parking is less likely with worksites located right downtown, and with finance, insurance and real estate companies.
4. The last finding had to do with the relationship between employer-paid parking and AVR. When employers pay only some of the parking cost the average AVR of all such worksites was found to be 1.37. But when employers pay the full parking cost, the average AVR was only 1.26. Thus, without any ridesharing incentives, just the process of shifting the parking cost to the employees changes the modal split away from SOVs and increases the AVR. It was observed that in suburban areas, the primary factors influencing the AVR numbers was: location of the worksite (with respect to distance from transit lines, and distance to the CBD), size of worksite, and type of industry.

3. Presentation #3
F.R. Jones and L.C. Lachance, "Parking and Transit Policy Implementation".

Two aspects were discussed in this presentation: 1) demographic and transportation statistics and how they are correlated to mode split, and 2) how to implement parking and transit policies at the local level.

Aspect #1. Statistics from 52 cities across U.S.A. indicate that:

1. there is a direct correlation between population density and transit usage.
2. employment concentration in the CBD is directly related to transit usage.
3. there is an inverse relationship between parking supply (ratio of downtown supply to the number of employees) and transit usage, i.e. as parking supply increases the transit usage decreases.
4. there is a direct relationship between average monthly unsubsidized parking rates and rate of transit usage.

Aspect #2. There are several concerns that need to be settled when parking and transit policies are being planned. These concerns are: a) economic development, b) investor requirements, c)

quality of transportation alternatives to SOV, and d) global policy coordination. This presentation discussed in more detail the last of these concerns

Global policy coordination is both a process (actual coordination) and a mind set (the desire by local officials to pursue coordination). Coordination is accomplished both on the formal (federal and state level legislations and regulations, local plans) and informal levels (working relationship between organizations, interactions between people in these organizations). Coordination should encompass all organizations on a local level.

Problems that need to be overcome to effectively coordinate transportation policies:

a) different local jurisdictions - often the transit agency is regulated by county, whereas parking authority is regulated by the city,

b) opposing objectives - many times parking and transit authorities have different objectives: parking: to maximize revenue, transit: to maximize ridership,

c) conflicting ordinances that go against coordination of parking and transit.

In the last part of the presentation two examples of government structure with respect to regulatory and coordination sides were shown. The first one was the existing structure, observed in several cases in South Florida. In the current structure there are no regulatory or coordination controls between parking and transit at the local level. The second example was the proposed structure. In it, the local level planning body is made responsible for both transit planning and parking.

Conclusions: Parking is very often outside the coordination that goes on at the local level. But, coordination can play a big part in fostering the relationship between parking and transit. It is not always the formal policies that accomplish the objective of increasing transit usage.

4. Presentation #4
J. Kessler, "Federal Parking "Cash-Out" Proposal".

This presentation discusses the nature of free parking, explains why is it so widespread and presents a solution to change that situation. Free or subsidized parking is an important factor in deciding whether to drive to work or not. When the value of the tax subsidy on employer-provided parking was compared with the value of a gasoline tax on a cent per person basis, it was found that the first was much larger. Offering parking is like offering a free car - it is a big incentive to drive. Free or subsidized parking is the most common work fringe benefit. The reasons for it are as follows:

a) many people have no other way to get to work but to drive, and because of that, employers feel it is necessary to provide lots of parking,

b) the federal tax code specifies that employer-provided parking is a tax-exempt benefit, whereas the same is not true for employee-bought/leased parking. Thus, employers find it to their advantage to provide free parking to their employees.

c) the federal tax code is set in such a way that if an employer provides any other travel

benefit instead of free parking, or any option together with free parking, the tax-exemption is lost. (the only exception to the above is a $60 travel allowance recently included in the code). Thus, it is no wonder employers provide free parking.

The need exists to eliminate employer-provided free parking. The most beneficial solution is the "cash-out" option. The argument for it is: if money is spend by employers on parking and the ultimate beneficiary of that money is the employee, then everybody is better off if the employee has a choice of how that money is to be used. The cash-out policy provides this opportunity. It lets the employee choose how the money is to be spent: as a parking cost or as a travel allowance. The "Cash-out" option benefits both employee and employer. With respect to the employee, the major advantage is that he/she is offered more choice. With respect to the employer, the program gives them a new tool in meeting trip reduction ordinances. When compared to other options (like parking taxes for example), it is beneficial or at least neutral. The "cash-out" policy can be implemented without significant cost, and it is not an administrative hassle.

The author admits he is sceptical about this policy working well everywhere. Nonetheless, it can be applied successfully in different situations. Studies have shown that the "cash-out" option can work well not only where transit service is good, but also where it is virtually absent, provided that is present is condition of high propensity to carpool.

5. Panel Disscussion:

Katherine Gerwig

10 reasons why employers don't charge for parking:

10. Tax laws do not support it. If an employer pays for parking then such payment is tax-exempt. If the employee pays for parking the tax exemption is not possible.
9. Employers do not want to create a competitive disadvantage for themselves and to be the first one on the block to charge for parking, or charge more.
8. Charging for parking can create inequities between sites for multi-site employers. Employers want to avoid that and therefore are reluctant to implement parking pricing policy.
7. There exists a lot of support for the symbolism of free parking as a work fringe benefit.
6. Employers do not believe that there is a viable transportation alternative, and that their charging for parking would influence employees to move from SOV mode to other modes of transport.
5. The belief that parking charging would have negative impacts on labour negotiations, and that compensation and benefit issue would become more complicated.
4. Lack of knowledge about evidence with respect to how much free parking increases SOV usage, and what benefits can be achieved when a policy of parking fees is implemented.
3. It is expensive and time consuming to set up the parking program. Issues of parking control, administration, staffing, etc. need to be a addressed and paid for.
2. Parking pricing is not a priority among employers even if they know the evidence and realize there are possible benefits.
1. Parking pricing programs are perceived as irreversible (once started they have to be

continued), which makes employers think twice before they decide to implement them.

Robert Dunphy

His major points were:

1. Lack of clarity and understanding as to do you do if you do not drive to work. Often there is not much choice. In the suburban areas, many times the only other feasible mode is carpool, and not transit.
2. Concern about what happens to CBD versus suburbs - long term land use patterns and how they are influenced by parking policies.
3. In downtown areas, there is a need to change the allocation of parking (not the amount of supply) to make these areas more attractive for shopping and cultural activities.
4. Desperately need more research in parking.

Herbert Levinson

His major points were:

1. There needs to be a balance between how much parking to provide for economic development (to attract new developers), and how little parking to provide to maintain good transit ridership and air quality.
2. Concern about "cash-out" policy due to the fact that it only involves employers who directly pay for the parking spaces. Because of that, this policy can only influence a small percentage of the total parking amount.
3. Concern that the zoning codes (minimum requirements specifying the amount of allowable parking) and "cash-out" policy are opposing each other. The first forces parking to be provided, the second discourages from using it. This point is especially valid for suburban areas where usually larger amount of parking are provided.
4. Other parking policies beyond that of "cash-out" option should be considered for implementation in the CBD areas; policies like: parking supply restrictions and parking pricing.
5. In the suburbs, office development should be limited to within a short distance of transit corridors; otherwise the existing congestion problems will continue to be propagated.
6. The parking policies discussed here should definitely be pursued in order to maintain the economy and mobility, and for environmental reasons.

Raymond Ellis

He raised three issues:

1. Issue of implementation and compliance. Before the policy is implemented, there are several details that need to be thought of and taken care of, on a regulatory level. Possible loopholes need to be addressed. For example, with respect to parking taxes, what to do if parking spaces are offered to both employees and customers.
2. Issue of long term implications in terms of land use patterns. Employers are moving towards the suburbs (some of that is caused by strict parking policies in the CBD areas), which could result in dispersion of employment centres and cause possible long-term problems with respect to air quality and traffic congestion.
3. Issue of implementing policies at the local level. Need to consider actions at the local

level, not only at the federal level, in order to achieve better results.

6. Rebuttals from main speakers:

John Hirten:

- Case studies show that when parking charges are introduced, many people switch from solo-driving to other modes. The above fact indicates that the argument, against introducing parking policies when there are few alternatives is not valid. People do find other ways of getting to work, perhaps not everybody but most do.
- In order to change things it is necessary to get to the root of the problem, and here the root is free parking. Provision of free parking because it is a business deduction is a fact that needs to be eliminated. Another fact that has to be abolished is that parking is a non-taxable benefit to the employee and other options are taxable. The above two facts are resulting in wide abundance of free parking.
- The preferred solution to the problem is a kind of "cafeteria plan" implemented by all types of employers in both CBD and suburban areas. The basis of such a plan is that the employers (both private and public) would offer some monetary allowance instead of parking. That allowance could be spent for travel expenses or for some other cause.
- The "cash-out" policy is too limited, too specific, too complicated. The "cash-out" option is better then nothing, but it is not great. It does not address the root of the problem.
- The important point is that parking needs to pay its own way. It is high time to start charging the automobile.

Waldo Lopez-Aqueres:
Concern as to what proportion of the employers would be impacted by the "cash-out" program if it was implemented on a large scale. Her personal feeling is that this proportion would not be very high. Another concern is that there is really no knowledge what degree of changes nationwide can be expected as a result of the program' implementation.

If the "cash-out" policy is introduced on a wide scale, a great deal of collaboration will be required between the federal government and employers, that is probably not going to happen, since it is not an easy thing to accomplish. In addition, different areas of the country are very unlike each other; thus it will be difficult to activate this new parking policy successfully on a nationwide basis.

Laura Lachance:
Expressed concern about possibility of any significant impacts from "cash-out" policy in the suburban areas. But, personal opinion is that the program should be given a go ahead.

Jonathon Kessler:
Need to look at parking policies as programs which try to accomplish multiple ends. The assumption should be that all resources should be used effectively, not just one. The "cash-out" option provides an opportunity to nibble at some big problems. It is true that this alternative is

not an optimal solution but at least it does something. There is a need to start small before proceeding on a large scale.

7. General Discussion:

The major points of the discussion were as following:

1. A concern about the free parking that is widely encouraged by the federal government. Everyone agreed that something needs to be done about this.
2. Possible elimination of "early bird special" parking rates. Such parking rates encourage solo driving during peak morning time which subsequently causes worse congestion. Long-term parking should be made much more expensive than it presently is.
3. Parking policies should be focused on employees not on employers. Better chance of success this way.
4. Concern that strict parking policies that are applied just in the CBD area will in the long run cause dispersion of companies into the suburbs and thus propagate the congestion problems. Parking programs need to be designed in such a way that they impact both the central and suburban areas. Since the "cash-out" option focuses primarily on CBD employers, the concern was expressed as to what will be its long term impacts.
5. Concern that the "cash-out" option is going to affect only a small portion of the parking market. Need actions that are much broader in scope.
6. A point was raised that the implementation of the "cash-out" policy is difficult from the employer point of view. There are no guidelines as to how to go about putting the program in practice. No assistance is provided. Lots of details need to be considered and taken care of. Because of the above, in California where an attempt has been made for years to activate this policy, there have been many cases of employer non-compliance observed.

B] Calgary GoPlan (1993-1995)

GoPlan Parking / Transit Project Team (1994), Calgary GoPlan - Calgary Downtown Parking and Transit Study Summary Report. Calgary, Alberta.

Recommendations of the GoPlan:

- examine the relationship of parking and transit in pursuing the overall "balanced transportation" goals of the city.
- improve transit
- develop strategies to increase vehicle occupancy, and
- develop parking strategies as transportation demand management measures

- The study focused on:
    1. a review of the supply and demand for parking and transit in downtown Calgary
    2. comparative review of downtown parking and transit policies in Calgary and other selected cities
    3. a review of financial and taxation issues related to parking in downtown Calgary, and
    4. a comparative review of park and ride facilities as downtown parking surrogate in

Calgary and other cities.

An important finding of the study was the existence of a strong relationship between transit use and parking supply per employee; transit use declines as the ratio of long-stay stalls per employee increases. Modal Split was found to be inversely proportional to the amount of downtown parking per employee and directly proportional to the amount of park-and-ride parking.

A target of 50% modal split for transit by the year 2024 is suggested, which would be achieved by:
a) adjusting the long-stay parking to 29,000 stalls to match the modal split goal.
b) ensuring sufficient short stay parking in close proximity to the final destination of drivers. These stalls must be exclusively short-stay.

Recommended Policies:

1. Match long stay parking to the modal split goal by the following:
   - long-stay parking should be used to support the peak hour work trip modal split to downtown.
   - examine options to reduce new and existing long stay surface parking along with the implications of each option
   - encourage residential development in CBD to reduce supply of peripheral long stay surface stalls

2. Promote the role of Calgary Transit
   - 30 year working target of 50% modal split be established for the downtown
   - examine policies that will enhance transit, namely:
     a. reserved bus lanes and signal preemption
     b. HOV lanes for buses and carpools
     c. policies to reduce SOV trips to downtown
     d. encourage employer based vehicle trip reduction programs such as cashing out, employer paid parking, provision of transit passes for employees, and formation of car pools.
     e. policies that encourage greater use of non-motorised transport.
   - increased transit investment

3 Parking maximums should be enforced through By Law 2P80 and Cash-in-Lieu Fund
   - one stall per 140m²of net office space.
   - cash-in-lieu fund be used for the provision of downtown parking
   - maintain current city policy regarding short stay parking which states that at facilities with 200 or more stalls in the downtown area, a minimum of 10% should be devoted to short term use by the public. Maintaining this level of short term parking is critical to achieving the target modal split.

4. Park-and-ride Facilities
   - park-and-ride facilities to be recognised as an integral part of achieving the target modal

split
- determine funding sources to augment the number of park-and-ride facilities

Other relevant technical reports prepared as part of the Calgary GoPlan (1993-1995) include:
- Calgary Downtown Parking and Transit Study; Downtown Parking Study, Report WPS No. 25-04-95, 1993
- Calgary Downtown Parking and Transit Study; A Comparative Analysis of Selected North American Cities, Report WPS No. 26-04-95, September 1994
- Calgary Downtown Parking and Transit Study; Park-and-Ride Facilities in Canada, Report WPS No. 27-04-95, October 1994
- The Price Effect of Demand and Supply Changes for Downtown Parking, Report WPS No. 24-03-95, March 1995

C] Rationale for a Downtown Auto Commuter Parking Policy (1996)

Morrall J. and Bolger D., "Rationale for a Downtown Auto Commuter Parking Policy, Paper Prepared for the Transportation Association of Canada 1996 Annual Conference.

Abstract:

"The importance of parking policies as complementary policies to an overall urban transportation strategy has been acknowledged as a key component in influencing both transit use and ridesharing. The main focus of this article is the relationship between downtown long-stay parking supply and transit use, and the implications of this relationship for developing downtown long-stay parking policies. Based on a survey of Canadian cities, it was determined that peak hour transit modal split to downtown areas is inversely proportional to the ratio of long-stay parking stalls per downtown employee. The analysis indicated that this relationship is highly statistically significant for Canadian and American cities. The implication of the findings is that the main choice with respect to establishing a long-stay parking". policy is directly linked to the modal split goal. Thus, policy makers should first establish a desirable and achievable modal split goal and then establish a long-stay parking strategy which would match the supply of long-stay parking with the modal split goal."

D] Strategies To Attract Auto Users To Public Transportation (1998)

Dueker, K., Strthman J. and Bianco, M., Strategies to Attract Auto Users to Public Transportation, TCRP Report 40, prepared for the Transportation Research Board

Findings Related To Mode Choice

"Most work trip travel is made by Single Occupant Vehicle (SOV). The high SOV rates result from a combination of auto-accommodating parking policies and inadequate transit service levels. Cities with restrictive parking practices, including higher parking prices, tend to have better transit service and higher transit ridership rates. Changes in factors related to parking price have a stronger effect on mode choice than do factors related to transit service; however, the most effective means of increasing transit share is by increasing parking price *and* improving transit

service. Effects are greatest in the urban core of larger metropolitan areas."

"The researchers used modeling techniques to answer four basic questions about parking, transit, and travel choice:

- How Does Parking Price and Transit Service Affect Transit Use in U.S. Cities?
- How Does Parking Price and Transit Service Affect Transit Use for Downtown-Destined Work Trips?
- How Does Increasing Parking Price Compare with Other Strategies in Reducing Work Trip SOV Use?
- How Do Different Parking Strategies Compare with One Another in Reducing Work Trip SOV Use?

Table S-1 outlines the eight parking policies that were assessed based on five selected criteria.

"Because no single strategy is both effective and politically acceptable, the researchers recommend the "combination approach" to parking policy. Six combinations are identified and defined: the parking market combination, the cashing-out combination, the special generator combination, the new growth combination, the commercial district combination, and the residential district combination." (see Table S-2).

TABLE S-1 Assessment of individual parking strategies

Strategy	Effectiveness	Scope	Political feasibility	Efficiency	Ease of administration
Increasing the price of parking, based on a tax on revenues	Moderate	*temporal*: broad *functional*: moderate-narrow *spatial*: moderate-narrow	Moderate	Low to moderate	Moderate to high
Increasing the price of parking, based on a tax on parking spaces	High in CBD with good transit service; lowest in suburban business districts or where transit service is low	*temporal*: broad *functional*: broad *spatial*: broad	Low	Low	Low
Cashing-out employer provided parking	Moderate	*temporal*: narrow *functional*: narrow *spatial*: narrow	Moderate	Moderate	Moderate
Expanding meters and accompanying residential permit programs	Low to moderate	*temporal*: broad *functional*: moderate-narrow *spatial*: narrow	Moderate	Moderate to high	Low to moderate
Parking impact fees	Very low in short term; somewhat greater in long term	*temporal*: broad *functional*: broad *spatial*: narrow	Moderate to high	Low to moderate	Moderate
Changes in zoning ordinances to restrict parking supply: • Decreased minimums • Parking maximums • Conditional-use permits	Very low in short term; somewhat greater in long term	*temporal*: broad *functional*: broad *spatial*: narrow	Moderate to high	Low to moderate	Moderate
Shared parking	Low	*temporal*: broad *functional*: broad *spatial*: narrow	Moderate to high	Moderate	Low to moderate
TDM: • Satellite parking-shuttle lots • Preferential parking for carpoolers • Transit-incentive programs	Low to moderate	*temporal*: narrow *functional*: narrow *spatial*: narrow	High	Moderate to high, unless high subsidies are required	Low to moderate

TABLE S-2 Combination packages: components, policy goals, and problem contexts

Combination and Components	Policy Goal and Problem Context
Parking Market • Increased parking prices • Cashing-out employer-provided parking • On-street meters and residential permit zones	Encourage transit ridership through explicit parking pricing in areas of congested peak-hour travel and parking
Cashing-Out • Cashing-out employer-provided parking • TDM	Encourage transit ridership by workers who park free in employer-leased parking
Special Generator • TDM • Increased parking prices • Cashing-out employer-provided parking	Encourage transit ridership by employees and users of "special generators": high-density employers with limited parking supply, such as hospitals, universities, and airports
New Growth • Cashing-out employer-provided parking • TDM	Address parking problems and decrease SOV use in suburban activity centers or other noncentral areas of new growth
Commercial District • On-street meters • Shared parking • TDM	Encourage transit ridership through explicit parking pricing in non-CBD commercial areas with parking problems
Residential District • Residential permit zones • On-street meters	Address parking problems in high-density housing areas susceptible to spillover parking from nearby commercial areas

E] Other Recent References:

Several other pertinent recent references have also been identified, though not assessed. They are:

- Hamerslag R., Fricker, J. and Van Beek, P. (1995), "Parking Restrictions in Employment Centers: Implications for Public Transport and Land Use", Transportation Research Record 1499, pp. 76-82.

- Verhoff E., Nukamp P., and Rietveld, P. (1995), "The Economics of Regulatory Parking Policies: The (Im)possibilities of Parking Policies in Traffic Regulation", Transportation Research (Part A), 1995, 2, pp. 141-156.

- Litman, T. (1995), Parking Requirement Impacts on Housing Affordability, Victoria Transport Policy Institute, October 1995.

- Planning Consultants Research and Daniel Benson & Associates (1996), Implementation of Parking Cash-Out - Employer Characteristics & Implementation Costs; Survey Results, Prepared for the South Coast Air Qulaity Management District.

- Planning Consultants Research and Daniel Benson & Associates (1996), Implementation of Parking Cash-Out - Employer Characteristics & Implementation Costs; Employer Guide, Prepared for the South Coast Air Qulaity Management District.

- Mildner, G., Strathman, J., and Bianco M., (1997) "Parking Policies and Commuting Behavior", Transportation Quarterly, Vol. 51, No. 1, pp. 111-125.

- Jia, W. and Wachs, M. (1998), Parking Requirements and Housing Affordability: A Case Study of San Francisco, University of California Transportation Center, Report UCTC No. 380